1853 THE BAKER-RAULANG CO. 100th anniversary 1953 THE BAKER-RAULANG CO.

The most maneuverable fork truck

■ Maneuverability ranks high among features essential to efficient fork truck performance. Finger-tip control of steering, ability to make sharper turns and operate in narrower aisles, complete accommodation to uneven roadways, effective snubbing of road shocks — these are some of the qualities engineered into Baker fork trucks which make them the most maneuverable in their class — and less fatiguing to the operator.

Automotive type steering assembly with ball-type joints and anti-friction bearings in the steering linkage give you a truck as easy to handle as your automobile. Proper steering geometry minimizes "scrubbing" of tires. The wide-angle steering axle is mounted longitudinally in jumbo-size rubber blocks. This absorbs road shocks and provides constant, smooth traction and travel despite the most adverse floor conditions.

Write for *your copy of the "Baker Handling Library" a new portfolio of actual case histories.*

THE BAKER-RAULANG COMPANY
1251 WEST 80th STREET • CLEVELAND 2, OHIO

The Baker-Lull Corporation • Subsidiary, Minneapolis, Minn.
Material Handling and Construction Equipment

Baker
industrial trucks

For more facts circle 502 on Reply Card

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Standardization Program for Material Handling Equipment

AN EQUIPMENT Standardization Program is being conducted by the Caster & Floor Truck Manufacturer's Association to standardize and simplify part sizes, descriptions, capacities and applications of products classified as Manual Material Handling Equipment, Casters and Wheels.

They are seeking the cooperation of all those persons involved in the design, production and use of a great variety of products in the industrial caster, wheel, and hand and floor truck classifications.

The Association is planning to set up six different standards program committees to: (1) prepare a standard nomenclature; (2) prepare a classification and description of the product types; (3) recommend standard sizes; (4) recommend capacities; (5) recommend applications; and (6) recommend standard testing procedures.

Those individuals and groups interested in contributing information and suggestions, thus speeding preparation of the standards and insuring complete coverage of all products concerned, are requested to write to the Equipment Standardization Committee, c/o Caster and Floor Truck Manufacturers' Association, 27 East Monroe St., Chicago 3, Illinois.

Industrial Trucks for Rent

A NOVEL nationwide plan which permits users to lease industrial lift and fork trucks and allied equipment rather than buying them has been announced jointly by the Philadelphia Division of the Yale & Towne Mfg. Co., and CIT Corp.

The new plan enables plants, warehouses, railroads and others to obtain materials handling equipment by paying monthly rentals as the machines are used. Under the program, the field sales organization of Yale & Towne's materials handling division in Philadelphia will negotiate leasing agreements for equipment with potential users. CIT will then purchase the required equipment and lease it to the user for an agreed period of time.

This leasing plan will help many companies meet their expanding production and service requirements. A corollary plan is also available for users who wish to purchase materials handling equipment on installment terms rather than lease.

Going to Materials Handling Show?

ANY ONE WISHING advance registration cards for the National Materials Handling Exposition, which will be held at Convention Hall, Philadelphia, May 18 to 22, may get them by indicating "MH Show" on one of the postal cards in this issue.

Combustion Conferences

ASSISTANCE IN ARRANGING combustion conferences for groups of power engineers, plant engineers, consulting engineers, and others in important coal-consuming markets is being offered by the Bituminous Coal Research, Inc.

Speakers are being made available and talks, slides and explanatory models have been prepared on several subjects. The first subject deals primarily with smoke problems caused by deficiencies in overfire air and turbulence in industrial and commercial boiler furnaces. Because of the wide interest in

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.

No trial and error on that job....
ARMSTRONG TRAP DATA are Reliable

THE most carefully calculated installation of steam-heated processing equipment will fail to deliver full output if the steam traps do not have adequate condensate and air handling capacity. When this happens an important part of the capital investment in plant and equipment is wasted.

After you have figured the amount of steam that will be condensed, you need data on:

Condensate Capacity—not theoretical, not estimated, not cold water, but actual test findings with traps discharging condensate at steam temperature.

Trap Capacity Safety Factors, or ratio between continuous discharge capacity and actual amount of condensate to be handled. These may run from a low of 2 to 1 or as high as 8 to 1. Armstrong data tells you just what safety factor to use to obtain adequate air venting capacity and maximum heat transfer.

Armstrong trap data helps you get traps "big enough" for the job, but not too big; assures you maximum operating efficiency; eliminates corrections after installation. For traps and trapping assistance call your local Armstrong Representative, or write:

ARMSTRONG MACHINE WORKS
912 Maple Street, Three Rivers, Michigan

HERE'S AN EXAMPLE of the reliability of Armstrong data: Armstrong trap capacity figures are based on hundreds of tests with condensate at steam temperatures. The checking effect of flash steam through the orifice as well as the back pressure created by flash steam were automatically taken into account. Actual hookups were used to allow for the effect of pipe friction.

If the capacity ratings had been based on cold water tests, which produce no flash steam they would be too high. Orifice test ratings are too high because they ignore the effect of pipe friction. Slide rule calculations of trap capacities have never been conservative.

When you use Armstrong Data and specify Armstrong traps you know that you are getting the right trap for the job.

SEND FOR the new 44-page Steam Trap Book—including 14 pages of data on how to size Traps for nearly every type of equipment. Free on request—no obligation.

ARMSTRONG STEAM TRAPS

For more facts circle 503 on Reply Card

LIKE AN
ATOM-IC
EXPLOSION
Just 1/32" (pinhole size) faucet leak
MUSHROOMS into ATOMIC WASTE
of approximately 95,000 gallons •
of water yearly—costing:
$24.14
@ $1.90 per M cubic feet
If a hot water faucet, then: (actual) FUEL WASTED heating 95,000 gallons costs approximately:
$88.91 if coal (9870 lbs.)†
$91.08 if oil (792 gals.)†
$84.41 if gas (84,411 cu. ft.)†
Above figures authenticated by Hackensack Water Co.* and American Gas Association.†
STOP this needless WASTE during today's MATERIAL and MANPOWER shortages with "SEXAUER" "Easy-Tites" that outwear ordinary faucet washers 6-to-1, thus SAVING labor on 5 REPEAT repairs, PLUS water and fuel, while prolonging the life of SCARCE fixtures.
PAT'D
"EASY-TITE"
FAUCET WASHERS
EASY-TITE
...a modern laboratory triumph, are compounded from du PONT NEOPRENE (tested up to 300°F.) instead of rubber—to withstand DESTRUCTIVE HEAT common in present-day superheating water systems—that formerly broke down washer's structure.
Built like a tire with fabric re-inforcement they resist the grinding, closing squeeze that SPLIT and MUSH ordinary washers out of shape...causing LEAKS.
Through combining NEOPRENE and FABRIC RE-INFORCEMENT they OUTWEAR ordinary washers 6-to-1 on hot or cold FAUCETS—thus you slash water, fuel and labor costs.
THE NEW "SEXAUER" CATALOG
Edition G, just out, pictures over 2500 TRIPLE-WEAR plumbing REPAIR parts and Pat'd. Precision Tools. It's today's accepted buying guide for discriminating purchasing and maintenance personnel among thousands of top PLANTS, INSTITUTIONS and GOVT. AGENCIES that rely on SEXAUER repair materials. Send for your copy today!
Then too, there's a SEXAUER TECHNICIAN with a quick call from coast-to-coast, who offers a special SURVEY service that sets up a schedule of the exact replacement parts required for your particular plumbing fixture regardless of make or age and without obligation.
A postcard will bring him and your NEW Catalog promptly.
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2503-05 Third Avenue, New York 51.
as advertised in the SATURDAY EVENING POST
SEXAUER
WORLD'S LEADING SPECIALISTS IN PLUMBING AND HEATING REPAIR PARTS
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cleaner air, coal consumers will be shown how solid fuel can be used efficiently and within city smoke ordinances.

Subjects in the combustion conference series will also cover other problems relating to combustion, such as coal and ash handling, combustion control, fly ash collection, and good engineering for coal-burning plants.

Groups interested in arranging a series of combustion conferences in their area are invited to contact the coordinator of this program, Mr. Charles H. Marks, Bituminous Coal Research, Inc., 488 W. Sixth Avenue, Columbus 1, Ohio.

New Hydraulic Group Formed in Philadelphia

RECENTLY 122 engineers and industrial executives in the Philadelphia area interested in hydraulic power systems met to form a new organization. The new organization will be affiliated with the ASME with the cooperation of the ASCE.

Activities of the group will be described by the term "fluid power systems." Two meetings with outstanding speakers have already been arranged; the first on February 18 and another on April 8. All persons interested in the subject are invited to attend. There is no obligation to hold membership in any engineering society.

Those interested in further details should contact the Chairman of the Organization Committee, J. S. Bennett, Vice President, American Engineering Co., Philadelphia.

Underground Corrosion Of Galvanized Steel

A STUDY OF underground corrosion of hot-dipped galvanized steel pipe has recently been completed by the National Bureau of Standards. Results confirm previous NBS work in showing that galvanized steel having 3 ounces of zinc per square foot of exposed surface is highly resistant to corrosion in many soils which are very corrosive to bare steel. The zinc coatings provided good protection in most of the soils.

Analysis of the data obtained in the course of the two NBS field studies shows that the minimum weight of zinc coating required to protect steel for a minimum of 10 years depends on the nature of the soil environment. In the NBS studies a 2-ounce coating gave sufficient protection in inorganic oxidizing soils, but for inorganic moderately reducing soils a 3-ounce coating was required. Highly reducing soils, both organic and inorganic, require coatings heavier than 3 ounces per square foot.

'ROUND ABOUT

In order to obtain maximum life from galvanized pipe in practice, it is necessary either to construct the entire piping system of galvanized pipe or else to insulate eletrically the galvanized sections from pipe of other metals. Otherwise, the zinc coating will be removed by galvanic action.

Further details of this NBS investigation are given in "Corrosion of Galvanized Steel in Soils," by Irving A. Denison and Melvin Romanoff, J. Research NBS 49, 299 (Nov. 1952) (NBS Research Paper 2366; 10 cents from Superintendent of Documents, Government Printing Office, Washington 25, D. C.)

Leaflet on Plant Safety

A NEW LEAFLET on plant safety—the fifth in a series of six on this subject—was issued recently by the Small Defense Plants Administration.

The leaflet, "Reducing Accident Costs Through Safe Work Methods," was prepared for SDPA by the Safety Engineering Staff, Bureau of Labor Standards U. S. Department of Labor.

No plant safety program can be really effective, the leaflet points out, unless the management takes the initiative in "organizing and supervising a continuing program of safety education and training; first, for their foremen, and second, through them for all their employees."

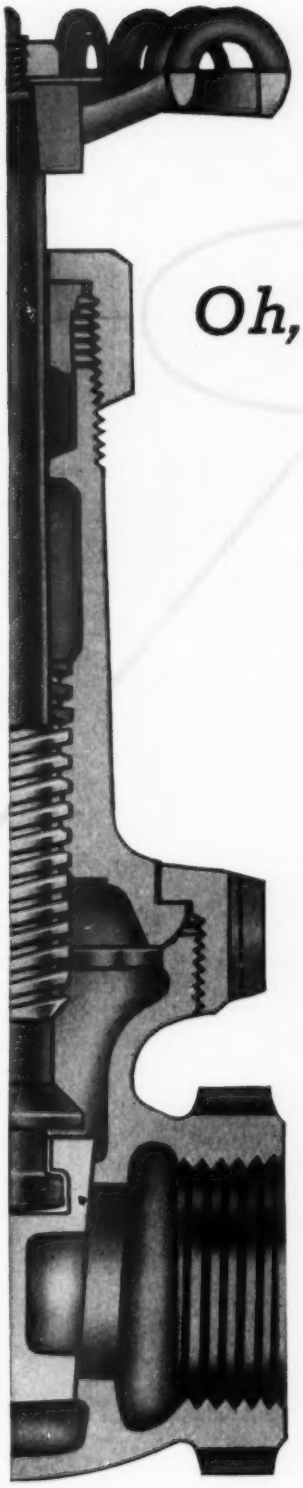
Other leaflets issued by SDPA in the plant safety series are: "Reducing Accident Costs in Small Industrial Plants"; "Reducing Accident Costs Through Safe Working Conditions"; "Reducing Accident Costs by use of Safety Committees"; "Reducing Accident Costs Through Reports and Records." The leaflets are available free on request at all SDPA field offices.

An Unusual Service

ANY COMPANY that is looking for some one to do its calculating problems would do well to check with the Mathematical Computing Service.

This company specializes in engineering calculations, preparing charts and nomographs of a high degree of complexity and the treatment of related problems in the field of industrial engineering. From given physical data, the consultants will prepare mathematical formulas and complete solutions of industrial problems.

Those interested in availing themselves of this service should contact J. L. Miller, Manager, Mathematical Computing Service, 105 Court St., Brooklyn 2, N. Y.



Oh, I see

This valve is packed with 70 years' experience

OIC's "7200 Line", the bronze valve that 70 years' experience built, incorporates the most advanced engineering, superior workmanship and the finest materials . . . its union bonnet, copper-nickel wedge and long-wearing OIC Alloy 40 stem, for example. You see the difference in the dependability, economy and long, maintenance-free life which OIC Bronze Valves give you.

THE OHIO INJECTOR COMPANY
WADSWORTH, OHIO

OIC
FOUNDED 1883

VALVES . . . FORGED & CAST STEEL, IRON & BRONZE

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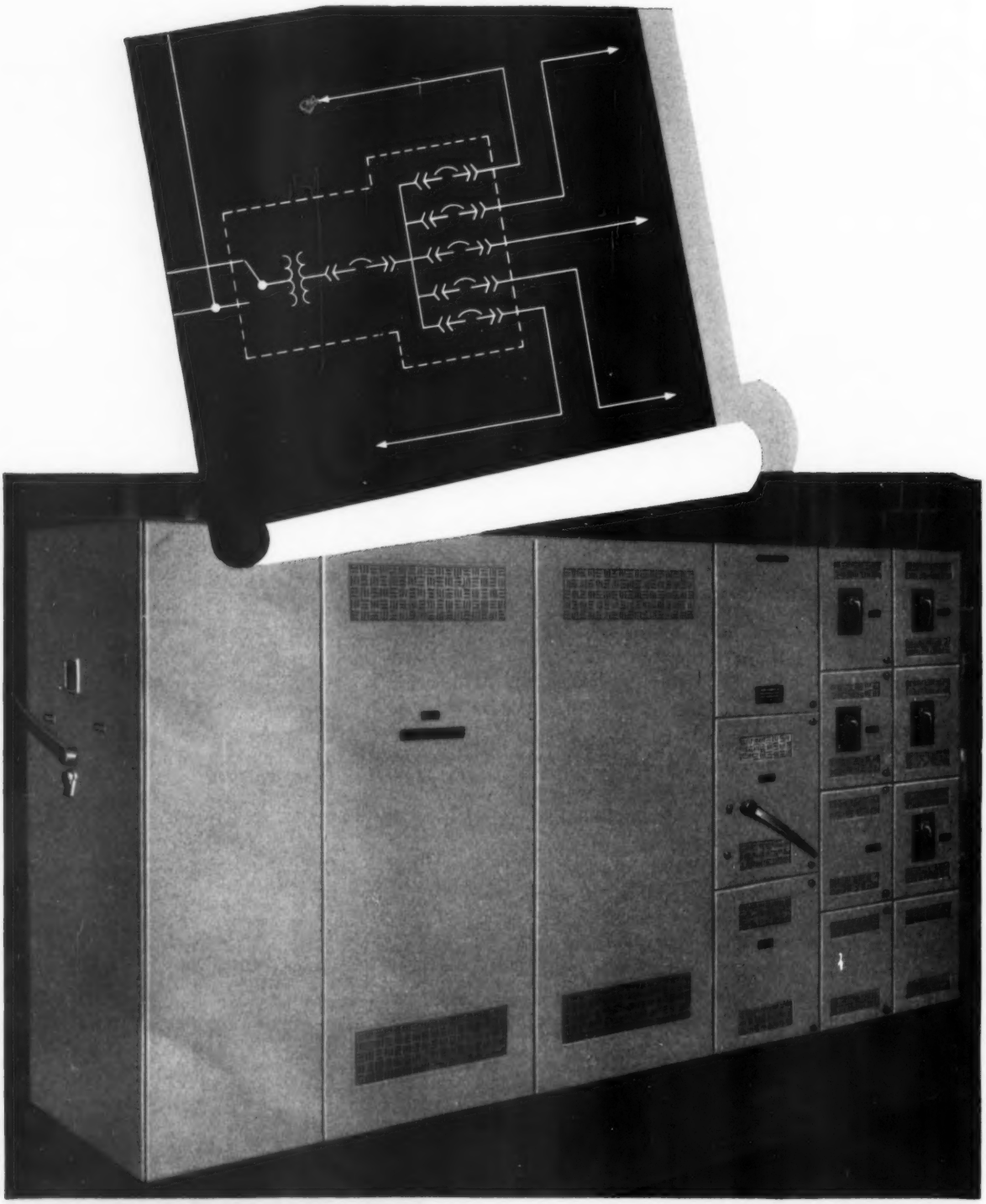


This complete factory-assembled Westinghouse Dry-Type Power Center cuts power distribution costs at General Metals, Vernon, California plant. The dry-type transformer eliminates fire hazard . . . the need for vaults . . . the expense of storing, filtering or replacing oil.

Here's how General Metals Corporation solved a load growth problem . . .

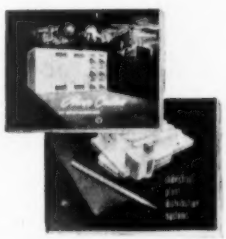
Economically!

A load growth problem at General Metals Corp. necessitated a switch to high-voltage distribution. To meet the growing load requirements, they selected a Westinghouse Power Center to serve a primary selective radial system. Note how they credit the power center for a big part of the savings.

> *"Initial savings resulted from simplified installation of the Power Center, and the use of shorter secondaries. Currently, improved voltage conditions and reduced line losses produce a saving in terms of more production output per kwhr used. And the unit's low maintenance and flexibility characteristics lead us to expect a similar return in the future."*

Westinghouse Power Centers offer *you* this same modern, low-cost way of attaining peak efficiency in your plant's power system. And they're available in types to suit the specific requirements of your operation. J-60772

GET THE COMPLETE STORY! Booklet B-4162 covers Westinghouse Power Centers in detail. Booklet B-4045 discusses various types of plant distribution systems wherein power centers offer maximum advantage. For your copies contact your Westinghouse Representative or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.



YOU CAN BE SURE... IF IT'S

Westinghouse

POWER CENTERS

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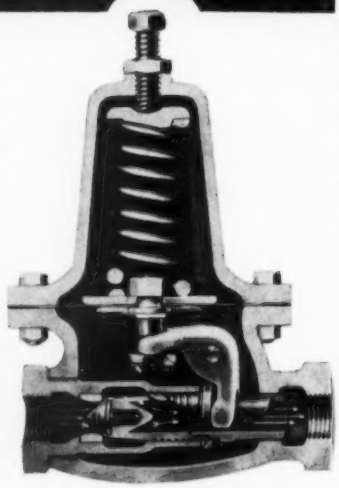
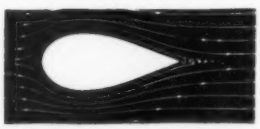
THEY'LL SEE YOU THROUGH WITH *Non-Stop Production . . .*

● Smooth, speedy, non-stop production is a vital thing today. It's a great advantage to have the dependability of operation—the smooth, even flow of steam, air, or oil—the better pressure control and greater capacity obtainable with the "1000" Valve. The Streamlined flow pattern pictured shows the valve action so important in keeping things going on the production front. Years after they have been installed, "1000" Valves perform so that you continue to realize all of the ten benefits listed below. The "1000" is known as the "NO TROUBLE" Valve.

POINTS THAT COUNT BIG IN YOUR FAVOR

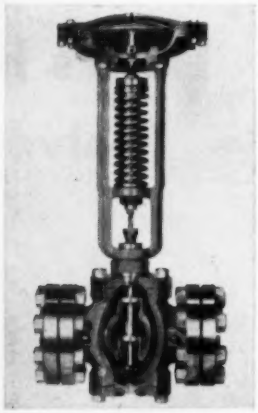
1. Maximum capacity when needed most
2. Accurate pressure control under toughest working conditions
3. Trouble-free service.
4. Smooth operation.
5. Tight closure.
6. Speedier production results.
7. Elimination of failures.
8. Cost-saving operation.
9. No spoilage.
10. Practically zero in maintenance.





HERE'S THE "1000" FLOW PATTERN
The Streamlined form of the inner valve eliminates turbulence. It produces the flow pattern shown at left which makes for maximum capacity when it is needed most and permits accurate pressure control under toughest working conditions.

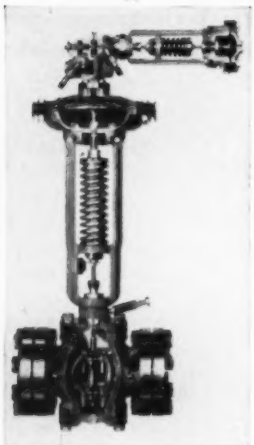
OTHER VALVES *from the* CASH STANDARD LINE



Cash Standard Type 34 Pressure Reducing Valve. For practically all fluids. Has roller bearing, also roller guides that kill side strains and stop packing trouble —no lost motion.

Sizes: ½" to 12" inclusive. Highest initial pressure 800 lbs.; reduced pressure vacuum to 150 lbs. Bodies: iron, bronze, steel. Trim: iron, bronze, stainless steel. Ends: screwed, flanged, ammonia type, welding type. Bulletin 968.

☆



Cash Standard Type 30-AP Valve gives precise control of fluid pressures, through a pilot connected to the pressure under control. For steam, water, air, and most fluids.

Can be a pressure reducing valve or a back pressure valve depending on the way the control lines are connected. Pressures up to 600 lbs. Sizes ½" to 12" screwed; 1" to 12" flanged ends; wide variety of metals.

☆

CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

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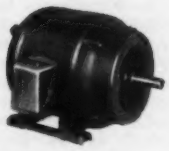
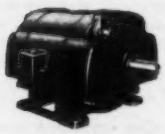
"All the best of all best features"



Horizontal C face mounting, frame with feet.



Splash-proof

Vertical flange mounting

Brake Motor

SEALED PRELUBRICATED BEARINGS
Requiring no attention and assuring years of service.

ALUCAST ROTORS
Practically indestructible. Bars, fans, and end rings are die cast, forming one solid piece.

DUAL VENTILATION
Cooling air is pulled in at each end of rotor, discharged around the stator and out each side of the frame.

VINYLASTIC WIRE
On all stators, the assurance of long life in thoroughly impregnated and baked vinyl-covered wire.

CORDED END TURNS
For strength and permanence.

PHASE-TO-PHASE INSULATION
Gives the extra life of insulating windings between phases.

Full details in Bulletin PB 6000-1, on request.

ELLIOTT Company

CROCKER-WHEELER DIVISION
AMPERE, N. J.

For large motors RIDGWAY DIV., RIDGWAY, PA.
Plants at JEANNETTE, PA. • RIDGWAY, PA.
AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES
ELLIOTT APPROVED SERVICE SHOPS COVER THE COUNTRY

W2-12

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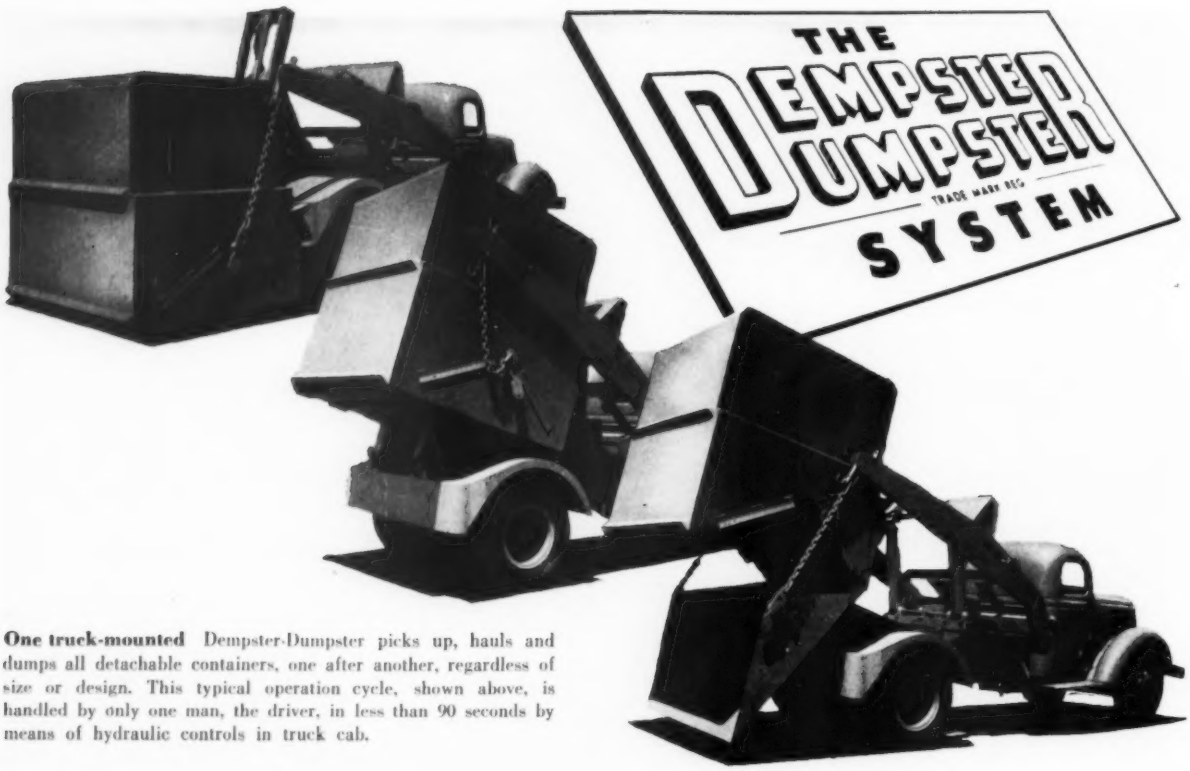
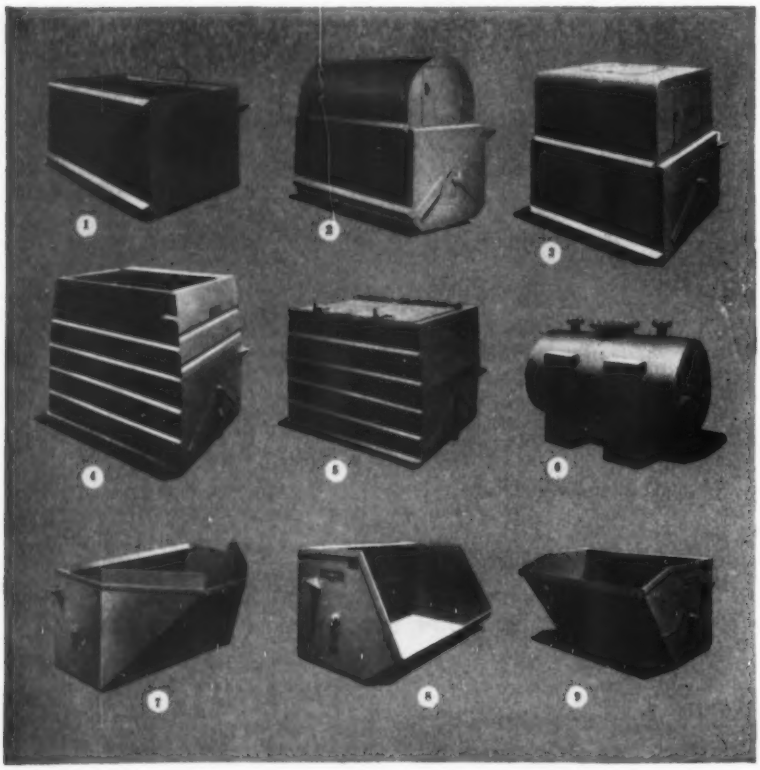


One truck-mounted Dempster-Dumpster picks up, hauls and dumps all detachable containers, one after another, regardless of size or design. This typical operation cycle, shown above, is handled by only one man, the driver, in less than 90 seconds by means of hydraulic controls in truck cab.



1—Cuts Cost of Equipment and Operation— It is not unusual for one Dempster-Dumpster to perform the work of from 3 to 5 conventional trucks . . . reducing investment accordingly. Eliminating trucks also means eliminating tires, gas, oil, maintenance and man hours.

3—Eliminates Re-Handling of Materials— Re-handling of materials, which by conventional methods are hand loaded by loading crews into dump trucks, is eliminated. Each detachable container remains at its convenient location until loaded. Then, in less than a minute, it is picked up by Dempster-Dumpster and taken to destination. There it is dumped or set down intact . . . saving hundreds of man hours annually.

• • •

At left are a few standard containers for general requirements—1—Drop Bottom Container built up to 10 cu. yd. capacity to handle heavy materials. 2—Apartment Type for bulk trash and rubbish with sump bottom for handling moist materials. 3—Universal Type available with top and end doors. 4—Drop Bottom Pressed Steel Type for lighter service. 5—Drop Bottom Pressed Steel Type with counterbalanced spring lids. 6—Tank Type Container meeting A.S.M.E. specifications. Capacities up to 1,200 gallons. 7—Tilt Type with Converged Lip for handling fine aggregate, wet or fluid materials. 8—Skip Type with Lip to assist in holding certain types of loaded materials in place. 9—Tilt Type for handling heavy materials. Built water-tight.

DEMPSTER BROTHERS

MOST EFFICIENT METHOD OF MATERIALS HANDLING BY TRUCK EVER DEVISED

If you collect and move bulky, light or heavy materials in your plant operation . . . be they solid, liquid, dust, rubbish or waste, the Dempster-Dumpster System merits your careful consideration and investigation. This revolutionary method of bulk materials handling by truck can save you thousands of dollars annually!

The fundamental reason why the Dempster-Dumpster System is the most efficient method of materials handling by truck is because, in this system, one truck serves scores of detachable containers. In other words, a truck-mounted Dempster-Dumpster . . . with only one man, the driver . . . picks up, hauls, dumps or sets down intact . . . one after another . . . any required number of big Dempster-Dumpster Containers.

The hydraulically operated Dempster-Dumpster is mounted on any make truck chassis of suitable size.

The steel containers are available in a wide variety of designs best suited to the type of materials handled—be they bulky, light or heavy . . . solids, liquids or dust . . . trash or rubbish. They range in size up to more than three times the capacity of the average dump truck body. The containers are spotted inside and outside your plant at convenient materials accumulation points. A few of the dozens of detachable containers are shown here so that you may see the flexibility of this system in handling all types of materials in your plant with one truck. It may be that none of these containers will fit your own particular need. But remember there are Dempster-Dumpster Containers that will, either standard or special design.

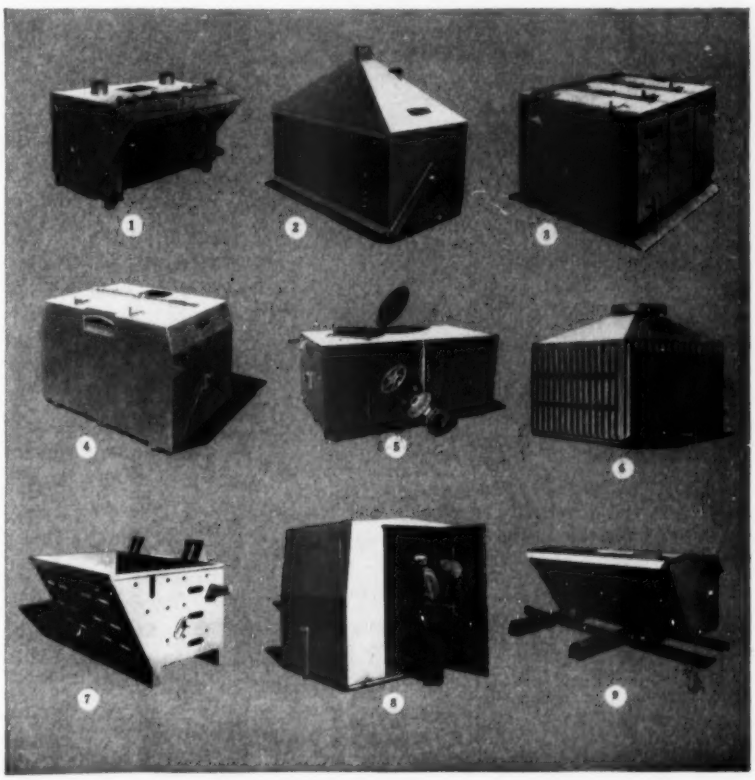
More efficient and lower cost materials handling in your plant may be simply a matter of getting the probing minds of your engineers and ours together. Our files contain hundreds of inquiring letters that ultimately resulted in savings of thousands of dollars annually in every conceivable type of manufacturing plant. A discussion with our engineers might develop the same results for you. If advisable, they will be glad to make, without obligation on your part, a proper survey to determine just what equipment you may need. The Dempster-Dumpster System is manufactured exclusively by Dempster Brothers, Inc.

2—Eliminates Standing Idle Time—One man, the truck driver, replaces truck loading crew. Detachable containers are pre-loaded through normal accumulation. Truck-mounted Dempster-Dumpster and driver never stand idle because there is always a pre-loaded detachable container to be serviced.

4—Increases Efficiency, Sanitation and Good "Housekeeping"—The Demp-Dumpster System is a complete, unified plan for area-wide materials handling. Materials to be disposed of or transferred are placed in a nearby container as they accumulate. Containers used for trash and rubbish are fire-proof, rat-proof and fly-proof. No other method of materials handling by truck can match the Dempster-Dumpster System in efficiency and low operating cost!

• • •

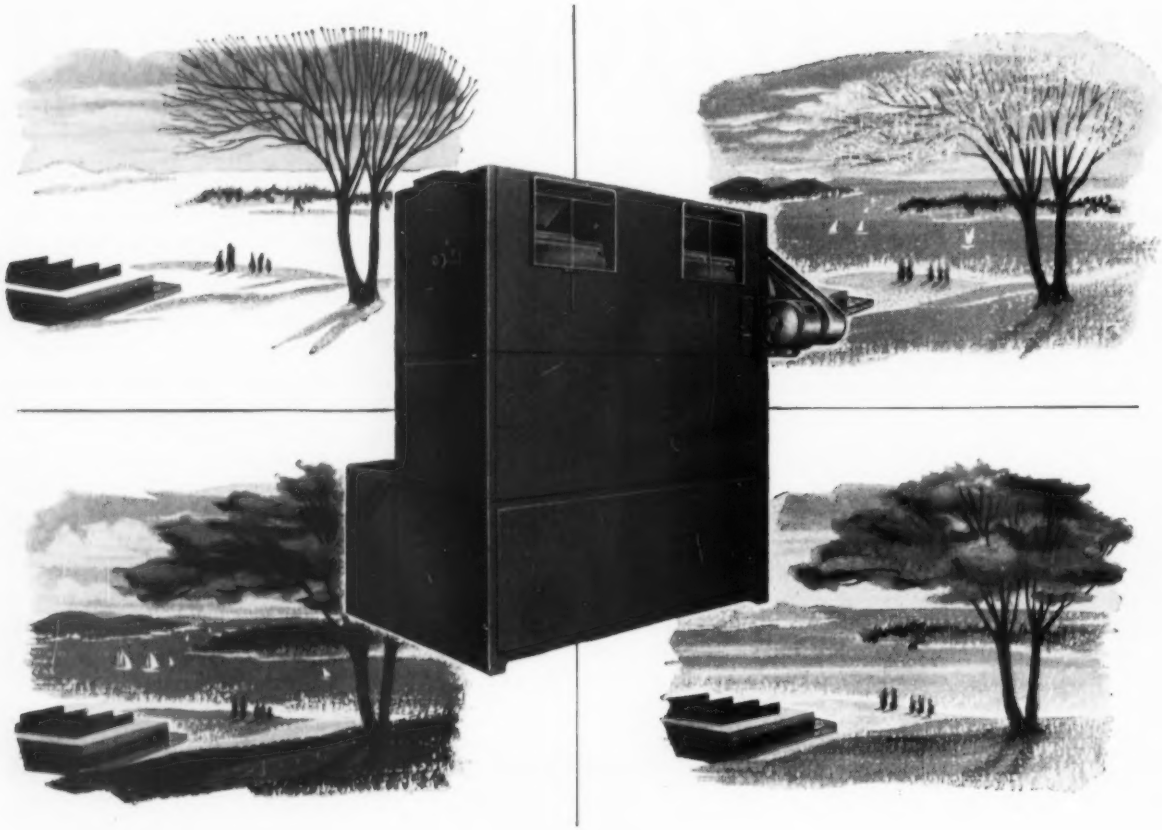
At right are a few containers built for special requirements— 1—Five cu. yd. container with swivel casters for handling waste blast sand. 2—Three cu. yd. Dust Collector Type equipped with gaskets. 3—Multi-Karry Container equipped with three 2 cu. yd. steel boxes with casters and lids. 4—Six cu. yd. drop bottom container with two spring-hinged lids and special loading opening in top. 5—Rectangular Tank Type Container with gate valve and gasketed Lid. 6—Chlorinator Ash Container designed for handling hot residue approximately 1500° F. 7—Tilt Type Container built for cast linings for handling hot materials. 8—One of several special "Tool and Equipment" Type Containers. 9—One of several types of special built containers equipped with ball bearing trucks.

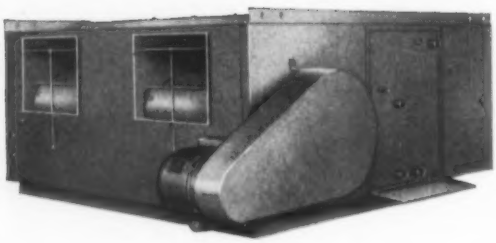


133 Shea Bldg., Knoxville 17, Tenn.

For more facts circle 509 on Reply Card

American Blower Air Conditioning Units





American Blower Type A Conditioner. Capacities from 1000 to 13600 cfm. Either direct expanded refrigerants, chilled water, well water or brine can be used for cooling and steam or hot water for heating.

American Blower Air Conditioning units are designed for summer cooling and dehumidifying and winter heating and humidifying.

This dual function by the same piece of equipment results in substantial savings in cost and offers much in comfort.

Three types are available: the Type A Conditioner for normal unitary type applications, the Type S Conditioner for unitary type application where washed air or high relative humidities are required, the Type M Conditioner for central system installation.

For data, consult the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

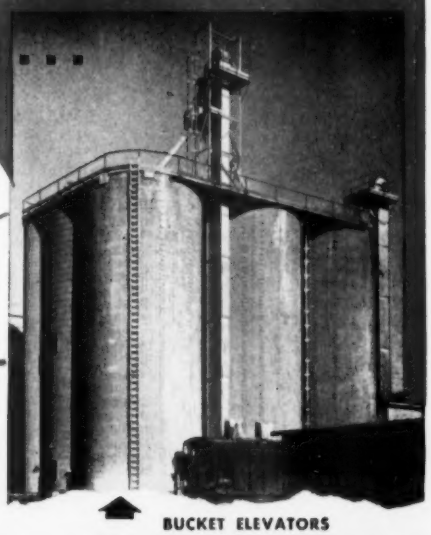
Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

For more facts circle 510 on Reply Card

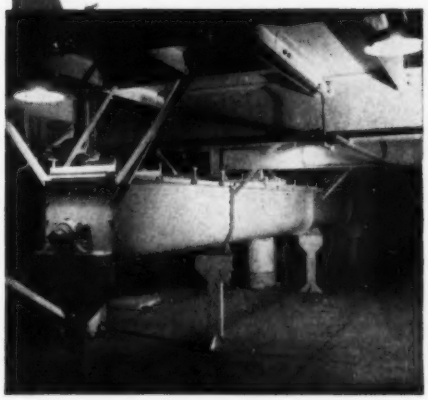
one unit or a complete system . . .

TO SPEED PRODUCTION

around the clock



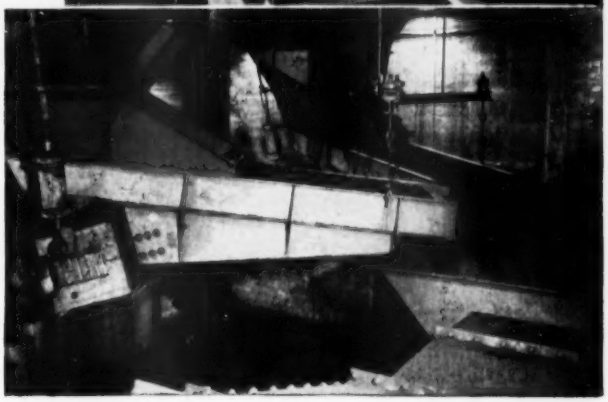
BUCKET ELEVATORS



BELT CONVEYORS

SPIRAL CONVEYORS

FEEDERS



Efficient, fast, low-cost production (24-hour service if need be) calls for adapting the right unit or units to each individual job. Since Jeffrey builds so many kinds of handling devices, isn't it logical to rely upon the recommendations of our Engineers?

Whether it's conveying, elevating, feeding, drying, cooling, crushing or pulverizing, packing or transmitting power . . . Jeffrey can provide the right unit—or complete system—with a working knowledge based on 75 years of experience and scores of installations. What is your materials-handling or processing problem?

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED

. . .IT'S A JOB FOR JEFFREY!

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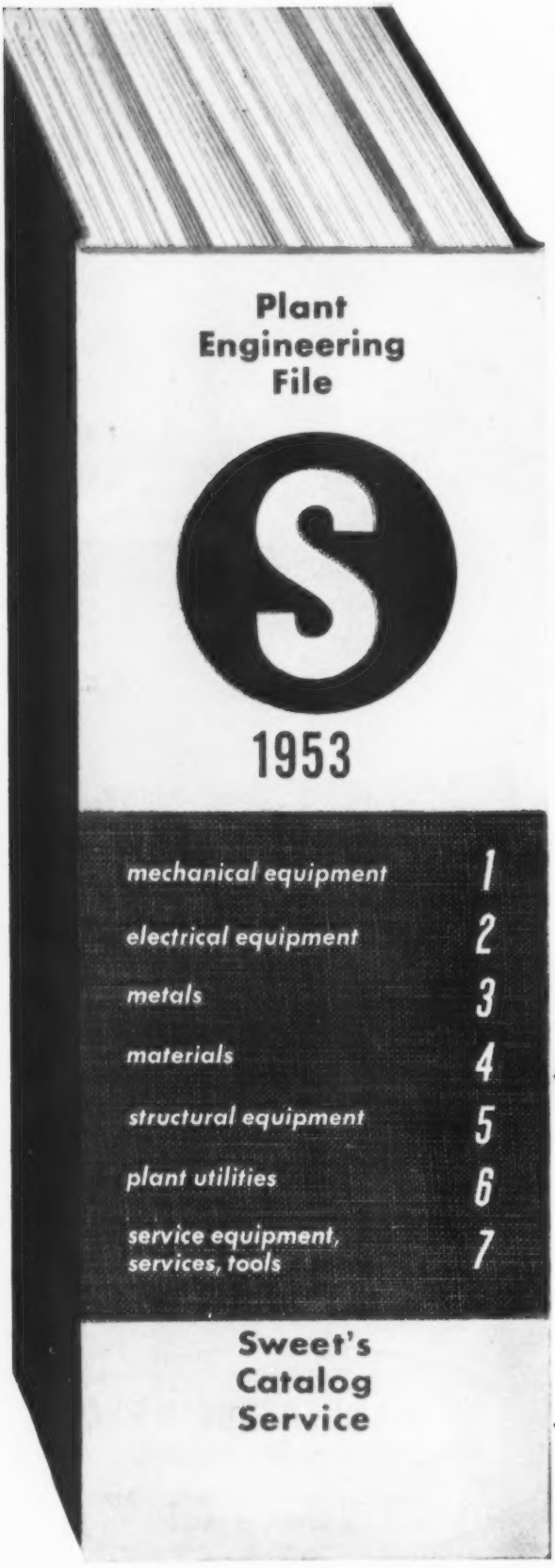
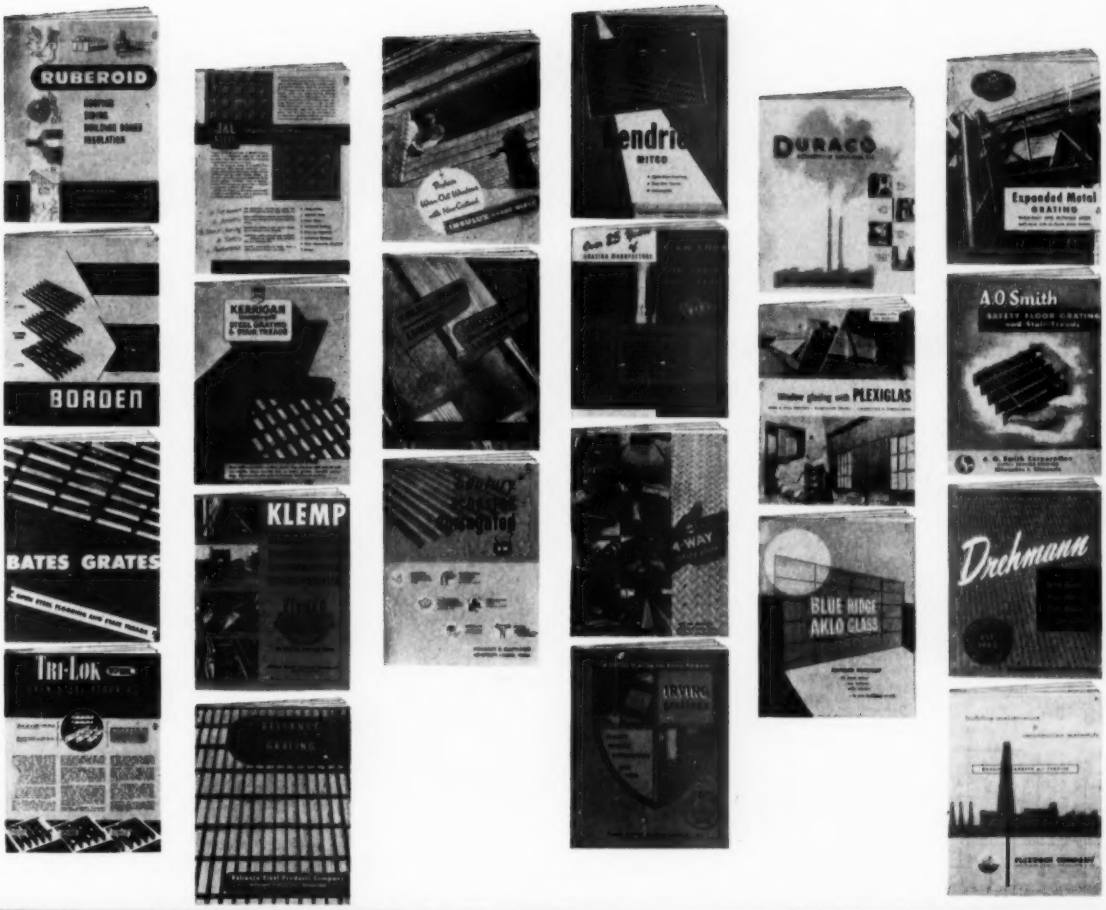


looking for materials?

"... a great time saver."



reach for your Plant Engineering File

All these manufacturers' catalogs, and many more, are instantly available in Section 4 of your Plant Engineering File.

They contain comprehensive information on materials like glass, plastics, wood and wood preservatives, roofing and siding, gratings, grids, floor plates, flooring and wall covering, paints, finishes and protective coatings, thermal insulation and refractories. Also, materials used in sound control, vibration isolation, waterproofing and masonry treatments.

In other sections of the File you will find additional catalogs containing useful information on a wide range of products used in the maintenance of all plant facilities and services to production.

This collection of 252 manufacturers' catalogs is grouped in sections according to products, or use of products, so that you can readily compare one product with another. Indexes of manufacturers, products and trade names lead you quickly to the catalogs you are looking for.

Sweet's is working constantly to get more manufacturers to send you their catalogs in this easy-to-use form. If you fail to find what you want, please tell us.

Sweet's Catalog Service

DIVISION OF F. W. DODGE CORPORATION
119 WEST 40TH STREET, NEW YORK 18, N. Y.

For more facts circle 512 on Reply Card

"Who said people don't like Black?"

Pitt Chem coatings withstand years of exposure to a wide variety of atmospheric and chemical conditions.

LET'S TALK SENSE about the color of protective coatings. Pitt Chem Tar Base Coatings, for example, are as black as the ace of spades. Our service engineers would never recommend them for the walls of your office. But—for the protection of equipment and structures against corrosion, we think their color is the most practical one you could select. And a recent survey shows that plant people agree with us. They select black as one of the two most popular of all industrial coating colors. Why?

It doesn't fade. It "goes" with all other colors.

It doesn't require cleaning. It creates no glare.

And remember this: The black color of Pitt Chem Tar Base Coatings tells you they're made of one of the most impervious and durable of all protective materials—coal tar pitch. For long-lasting, economical protection against most mineral acids, alkalis, corrosive vapors and moisture, there's no finer protective material on the market today. ● If you have a corrosion problem write or call a Pitt Chem Coating Specialist today. He'll gladly make recommendations . . . without cost or obligation.

PITT CHEM 101
For severest corrosive conditions

PITT CHEM 102
A thin, high gloss maintenance coating

PITT CHEM 103
For metal exposed to vapors, dilute acids and alkalis

PITT CHEM 104
For equipment handling potable water

AND OTHER SPECIALTY COATINGS

PROTECTIVE COATINGS DIVISION

PITTSBURGH
COKE & CHEMICAL CO.

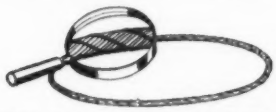
Grant Building • Pittsburgh 19, Pa.

W&D 4555

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

For more facts circle 513 on Reply Card

What is a Grommet?

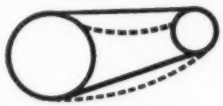


It's the endless rope of strong cords that pulls the load. It's twisted for strength . . . positioned in the belt so every cord pulls its full share of the load . . . and flexible to reduce internal friction. It's unlike anything else on the market.

Grommets Grip Better

Straight sides bulge slightly when belt passes around pulley. This helps give belt its tremendous grip. In addition, grommet belts are more flexible. No need for stiffening plies of cord. This, too, adds gripping power. Size for size, grommet belts give ⅓ more gripping power than ordinary belts, pull heavier loads with a higher safety factor. And less slip means less surface wear.

Grommets Stretch Less



Since there is no dishing, there is more strength in proportion to cord volume — and less stretch. Grommet belts stretch an average of two thirds less than ordinary belts . . . yet withstand shock.

No Dishing with Grommets

Each grommet carries its fair share of the load. In ordinary belts the center cords "dish" under high tension. Dished cords do less work. Grommet belts have no cords in the center of the belt.

3 WAY SAVINGS!

Here's how you save with TEXROPE grommet V-belts:

1. **Grommet belts cut costs — belts are constructed for long life.**
2. **Grommet belts reduce downtime — machines run with few stops.**
3. **Grommet belts cut maintenance — few man hours are spent making unnecessary belt changes.**

Grommets Cost No More. *Texrope* grommet belts cost the same as ordinary belts of the same rating. The savings you make are clear profit.

Grommet belts are made in C, D and E sections. They were developed as a result of cooperative research of Allis-Chalmers and B. F. Goodrich and are made under B. F. Goodrich patent.

Call your nearby Allis-Chalmers distributor or District Office for a set of long life grommet V-belts, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3940

Texrope is an Allis-Chalmers trademark.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

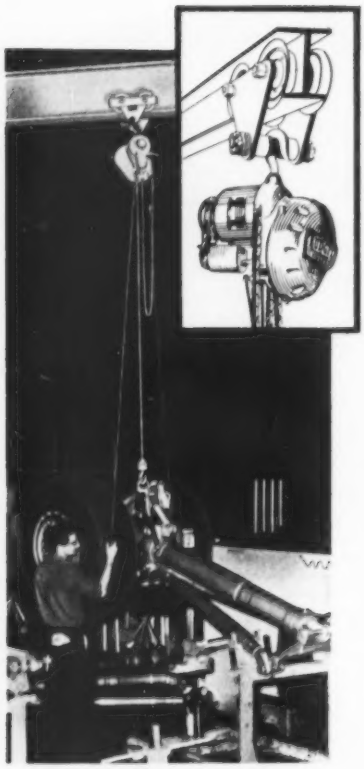
MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS

For more facts circle 514 on Reply Card



GIVE OUTPUT A BOOST!

Help manpower do more. Let the speed and efficiency of the 'Budgit' Electric Hoist step up defense and civilian production. The ¼-ton size lifts the full load in less than two seconds. All it takes to start this fast lifting action is a slight pull on the control cord with one hand. No muscle strain. Hoisting is easy, safe. A 'Budgit' Hoist lifts all day for a few pennies' worth of current.

The 'Budgit' Hoist is a complete, portable load-handling unit. No extras to buy. Just hang up, plug in, use! Capacities: 250 to 4,000 lbs., A.C. and D.C. models. Prices start at $119. Bulletin 391 on request.

A 'BUDGIT' I-BEAM TROLLEY makes any hoist more useful. Tough steel construction. Ball bearings in wheels. Adjustable to fit several sizes of I-beams. Capacities: 500 to 4,000 lbs. Priced from $13.50. Write for Bulletin 390.

MAXWELL MANNING MOORE

'Budgit'®

ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial Instruments.

For more facts circle 515 on Reply Card

BACKTALK
ABOUT PAST ISSUES

Problem: To Prevent Light Bulbs Shattering in Refrigerated Rooms

PLANT ENGINEERING:

"In the August, 1952 issue there was an article titled, 'Safety Is Sprayed on Glass Panes', and we are wondering if the plastic mentioned could be used on electric light bulbs.

"Can you furnish us the name of the plastic and the concern from whom it is available? We would like to obtain a small quantity to make a test with the object of eliminating shattered glass in our zero temperature rooms." *Mulford L. Fisler, Assistant Manager, Glassboro Cold Storage Corp.*

Reply from Manufacturer:

"Thank you for the letter advising us of your interest in the application of plastic as a glass shatterproofing material on light bulbs in zero temperature rooms.

"Frankly, we have never tested Liquid Envelope Clear No. D-2089 under the particular set of circumstances outlined in your letter but do feel that perhaps if the bulbs generated excessive heat it would tend to deteriorate the film. We also know that temperatures below -40 F do tend to make a Liquid Envelope film brittle." *M. C. Bryant, Industrial Sales Manager, Better Finishes and Coatings, Inc., Newark, New Jersey.*

Only Photostats Available, Now

PLANT ENGINEERING:

"Please send us your article entitled 'Parking Lot Layout Is Planned to Handle Large Volume of Cars,' by V. McCabe, appearing in the July, 1950 issue." *J. W. Murphy, Assistant to Manager, Philadelphia Gas Works.*

Editor's Note: Unfortunately, our demand for tear sheet reprints at the time the article appeared and the subsequent renewed requests have entirely depleted our supply. However, we are able to supply photostats of these three pages but there is a charge of 35 cents per page to cover photostat costs.

Request for Lighting Reprints

PLANT ENGINEERING:

"We have read with interest the initial article on 'Lighting for Seeing in Industry," by Leonard V. James.

"We have noted that additional articles will appear in future issues forming a complete brochure on the subject of lighting.

"We would appreciate being placed on your list of persons wishing to receive reprints of the entire series. The writer serves as Plant Engineer of Austenal Laboratories and if there are charges for these reprints, our company would be very glad to pay these charges." *Paul H. Beier, Plant Engineering, Austenal Laboratories, Inc.*

Editor's Note: There is no charge for the first set of reprints of the entire series; however, there is a charge of $1.00 for any additional reprints that you may desire.

A Popular Plant Engineer

PLANT ENGINEERING:

"Would it be possible for us to secure a copy of the photograph which appears on page 90 of the November, 1952 issue?

"The story concerns the organization of the Pittsburgh Plant Engineers' Association of which our own Mr. C. A. Wedge was appointed temporary secretary-treasurer. We would like to use this in our house organ.

"If you have a print available, we would appreciate your forwarding it." *Thomas P. Neel, Advertising Department, Mine Safety Appliances Co.*

Letter from Argentina

PLANT ENGINEERING:

"We have read in an English magazine a notice headed 'Scrap' concerning an article on pages 94-100 of the July, 1952 issue of the United States publication PLANT ENGINEERING having for a title 'Scrap Handling Problems.'

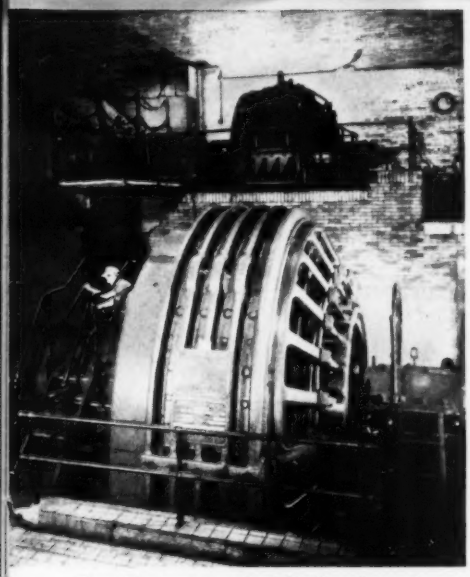
"As we are very interested in getting the above article, we shall appreciate your advising us of the best manner of obtaining it." *Carlos S. Llorente, Sub-Gerente, La Cantabrica, Buenos Aires, Argentina.*

Records Storage Data

PLANT ENGINEERING:

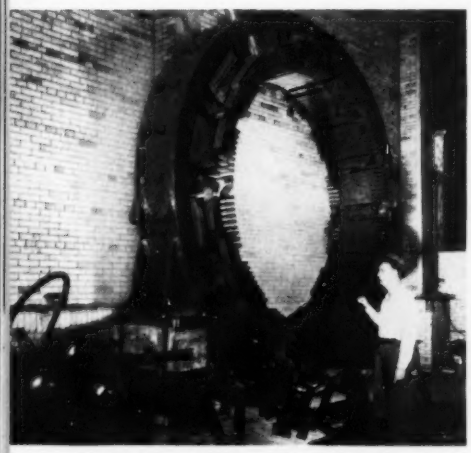
"Have you published articles dealing with the problem of record storage in industrial plants? If so, could I have reprints or tear sheets? If not, do you know of any articles on this subject to which you could refer me?

"The problem I have in mind is the annual accumulation of transfer cases containing files of correspondence, orders,



Complete spares are kept for these key motors—a 7000-hp reversing-mill drive motor and the slabbing mill's 1650-hp d-c screwdown motor.

Wheeling Steel's equipment reconditioning program at Steubenville was planned by its superintendent in charge of operation and maintenance of electric equipment, James Farrington (right). Helping him are (right to left) George Merrick and Henry Ford, assistant superintendents, and (standing) Karl J. Doll, manager of the G-E Apparatus Service Shop in Pittsburgh.



Ready to replace any of 3 generators in the plant's main motor-generator set (already reconditioned) is this spare 2400-kw generator frame.

Motor pool comprises smaller spare motors, all reconditioned. Full information on each motor and its location is maintained in an equipment record system.

Standby renewal parts for electric equipment are kept in this storage room, one of several at Wheeling.

***Productive* Maintenance** "kit" contains helpful maintenance literature, plus "tools" that help sell management on need for full maintenance program.

Management is "Maintenance-minded" at Wheeling Steel Corporation

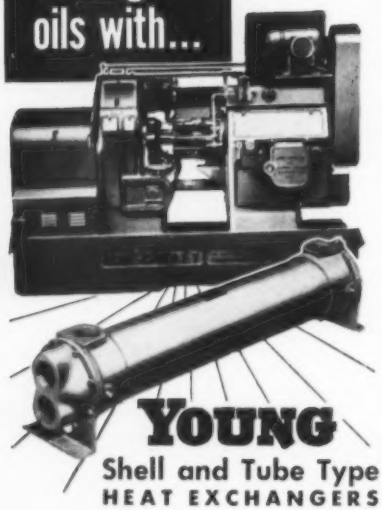
Here's how to develop management support for your maintenance program

Wheeling Steel Corp., of Wheeling, W. Va., shows what maintenance men can really do with full management support. "Our successful maintenance program," says J. H. McElhinney, operating vice president, "was devised and supervised by our maintenance department" and plays a major part in keeping output high.

To help *you* present your maintenance story to the top men in your plant, General Electric offers a new *Productive* Maintenance program. Its spearhead is a kit of maintenance information that helps you *prove* how Productive Maintenance can raise *your* plant's output. For your kit, contact your nearest G-E Apparatus Service Shop or write to General Electric Co., Section 801-8, Schenectady 5, N. Y.

GENERAL ELECTRIC

COOL
machine
cutting
oils with...

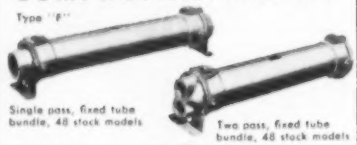


YOUNG
Shell and Tube Type
HEAT EXCHANGERS

Efficient cooling of tool cutting oil used for machining aluminum parts at a large Midwest die casting company is being done by Young two-pass, shell and tube, fixed bundle Heat Exchangers. By lowering oil temperatures at the cutting tools, seven Acme-Gridley chucking machines are operating at maximum production speeds. In addition, the aluminum parts are easier to handle. For further details, see your Young Representative, or write direct.

COMPLETE LINE IS
COMPACT...EFFICIENT

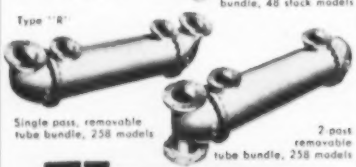
Type "F"



Single pass, fixed tube bundle, 48 stock models

Two pass, fixed tube bundle, 48 stock models

Type "R"



Single pass, removable tube bundle, 258 models

2-past removable tube bundle, 258 models

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Young Quality

Heating, Cooling, and Air Conditioning Products for Home and Industry.

T. M. REG. U. S. PAT. OFF.

YOUNG RADIATOR COMPANY
Dept. 323-C • RACINE, WISCONSIN
Factories at Racine, Wisconsin and Mattoon, Illinois
For more facts circle 517 on Reply Card

invoices, etc., which must be kept for a reasonable number of years. I do not refer to engineering drawings, machine records and other data that must be stored practically indefinitely.

"Any information along these lines would be much appreciated." *E. T. Harbert, Assistant to Works Manager, Canadian Ingersoll-Rand Co., Ltd., Sherbrooke, Quebec.*

Editor's Note: Please refer to the articles "Record Storage Can Be Improved," by John E. Fellows, in the February, 1950 issue; and "Planning a New Records Storage Center — Now a Current Problem," by E. J. Leahy and W. A. Clarke, in the March, 1951 issue.

Bulletins Teach Safety

PLANT ENGINEERING:

"Many thanks for your permission to reprint 'Accident Bulletins Tell All' from the December issue, and also for the samples of bulletins used to illustrate it.

"Might I also trouble you for two sets of tear sheets of this feature, which we hope to include in our February issue." *Mort Friedlander, Editor, The Foreman's Digest.*

Best Way to Reproduce It

PLANT ENGINEERING:

"In the October, 1951 issue, you published a short article, by John B. Bennet, entitled 'What's the Best Way to Reproduce It?'

"We would like permission to reproduce this article for distribution to students in a course entitled Industrial Reports, which is offered to Ford Motor Co. personnel." *Archie A. Pearson, Manager, Training Department Ford Motor Co.*

Letter to Mr. James

PLANT ENGINEERING:

"I have just read the January, 1953 issue and note a very interesting article beginning on page 74, 'Lighting for Seeing in Industry.'

"May I have your permission to reproduce Fig. 2 on page 75 and Fig. 6 on page 76 of this article in our revision of *Industrial Management*, giving full credit to the magazine as its source." *William R. Spriegel, Dean, The University of Texas.*

Questions on Power and Light System Article

PLANT ENGINEERING:

"In going over the material recently sent to me on the article 'Choose Power and Light Systems by Careful Cost Analysis,' by R. R. Lang, appearing in the April, 1952 issue, there are some questions that occur to me.

"I note that the subject was limited to 'non-manufacturing buildings.'

"1. Are these considered 'non-manufacturing buildings': commercial buildings, warehouses, office buildings, schools, and plants using light machinery material or such?

"2. Since this article was published, has any information of the application of this method been advanced for manufacturing plants?

"3. How widely has this method been made use of in the industrial or commercial field?

"To me, the method advanced appears to be rather restricted; however, not being a specialist in illumination itself, I would not want to lean toward it without further data." *Gilbert C. Lamb, Electrical Engineer, Milwaukee, Wisconsin.*

Editor's Note: In answer to the first question, the non-manufacturing buildings referred to were, as you supposed, all types of commercial buildings, including office buildings plus schools and similar institutional buildings.

In answer to the second question, we recently published another article by a different author on the characteristics of this same system in industrial plants. This appeared in the December, 1952 issue, under the title, 'The Cost Factor in Common Power and Light Systems,' by John G. Howell, Jr.

As to the third question, we do not have any figures regarding the number of such systems being installed, but you will note that Mr. Howell, the author, states that the system is becoming increasingly popular in industrial plants.

BACK TALK

Brick and Mortar Facts

PLANT ENGINEERING:

"We are interested in your article, 'Pre-Cast Wall Construction Cuts Industrial Building Costs,' page 86-87, in the January, 1953 issue.

"We would appreciate your sending infomation on the construction procedures involved. We are especially interested in the column construction, reinforcement, and method of connecting walls to columns." *C. A. Stang, Plant Engineer, Baldwin-Lima-Hamilton Corp.*

Request for Safety Article

PLANT ENGINEERING:

"If available, we would like to have up to six copies of the article 'Accident Loss Control Committee Cuts Severity Rate in Half,' as published on page 69 of the February, 1953 issue.

"These are requested for our Safety Section and for the Hartford Insurance Co. representatives in this area." *W. E. Adams, Plant Maintenance Superintendent, Pan American World Airways, Inc.*

Mobile Maintenance Truck

PLANT ENGINEERING:

"It is our understanding that on page 86 of the December 1952 issue you published a story on a mobile maintenance truck. We are builders of lubricating trucks and would be very much interested in receiving a copy of your December issue." *E. M. Smith, Secretary, Cemco Industries, Inc.*

3 LINES OF SAFETY SWITCHES *for* 3 DIFFERENT MARKETS

one line can't do two or three jobs without compromising price and performance!

GENERAL PURPOSE

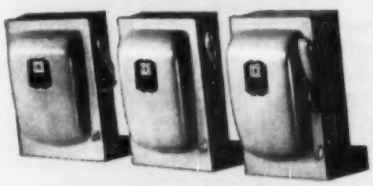
90,000 line designed for residential, commercial and other applications where price is limiting and the service factor is not great.

INDUSTRIAL

40,000 line designed for general industrial or institutional and commercial applications where the service factor is greater and price is an important consideration. MEETS BOTH GOVERNMENT AND NEMA SPECIFICATIONS FOR TYPE A SWITCHES.

HEAVY-DUTY INDUSTRIAL

80,000 and 50,000 line designed for mass production industries where price is secondary to continued performance under conditions of severe service and maximum safety. The 50,000 line is used where space is limited. BOTH ARE TYPE A but go far beyond those requirements.



UNIFORM STYLING

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

1903 · 50 YEARS OF DESIGN LEADERSHIP · 1953

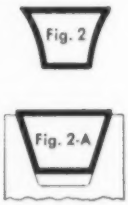
WHY
Gates V-Belts Wear Longer-

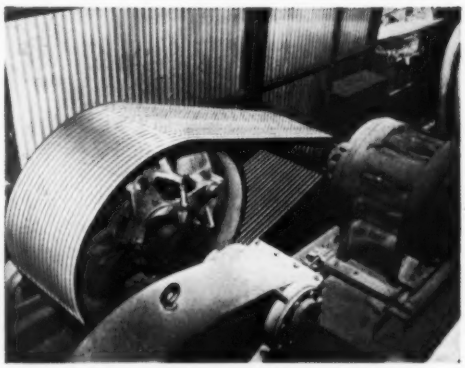
The CONCAVE SIDE (U.S. Patent No. 1813698) is what gives the Extra Wear!

Take any *straight-sided* V-Belt (Fig. 1) and bend it as it bends in going around its pulley. You will clearly see its sides *bulge out* (Fig. 1-A). These sides therefore press *unevenly* against the V-pulley and this causes extra wear at the point shown by arrows (Fig. 1-A).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2).

You will see the precisely engineered CONCAVE SIDES fill out to an exact fit in the sheave-groove (Fig. 2-A). The sides press *evenly* against the V-pulley. All wear is distributed *uniformly* across the *full width* of the Gates Vulco Rope—and this means longer belt *life* and *lower* belt *costs* for you.





Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear.

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE SIDES—the Gates Vulco Rope!

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

CS-533

V-Belts – Hose
Molded Rubber Goods
for Industry
World's Largest Maker
of V-Belts

Gates® VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

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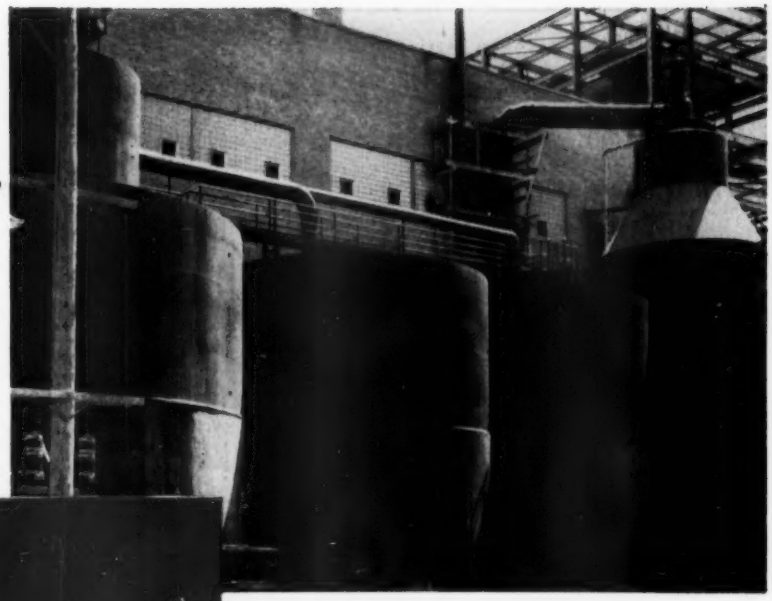
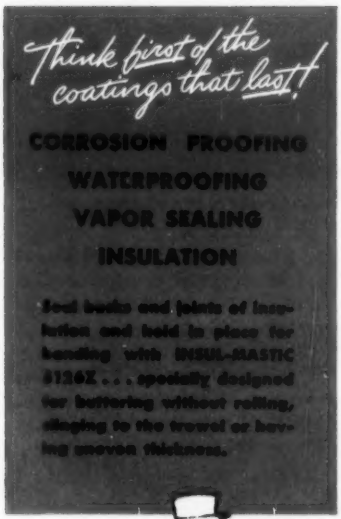


Only A SUPERIOR COATING ..... INSUL-MASTIC

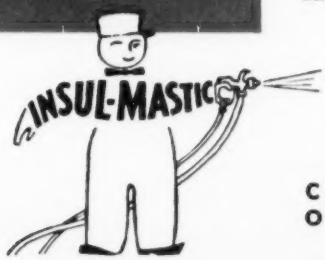
can keep your thermal insulation dry and protect the tank beneath it



17,000 square feet of tank surface at the Thilmany Pulp and Paper Company, Kaukauna, Wisconsin are protected by INSUL-MASTIC Coatings. INSUL-MASTIC 4010 vaporseals the joints and protects the surface of non-absorbent insulation on the lower half of filtrate tanks. Higher on the tanks, where less insulation is needed, INSUL-MASTIC TYPE "D" both insulates and prevents corrosion.

Where absorbent insulation is used, INSUL-MASTIC 4010 is needed even more because an inferior coating might permit rain or moisture vapor to dampen the insulation. Such a blanket of wet insulation held against your tanks for very long would cause severe corrosion that would mean complete re-insulating.

INSUL-MASTIC prevents such loss since its moisture vapor penetration rate is only .01 . . . practically nil. INSUL-MASTIC has exceptionally long life, due partially to the generous use of Gilsonite and mica. It is extremely resistant to acids and alkalis, a property of Gilsonite. Its temperature range is —40° F. to 300° F., and it is homogenized so that nothing settles in the drum.



Insul-Mastic

CORPORATION OF AMERICA

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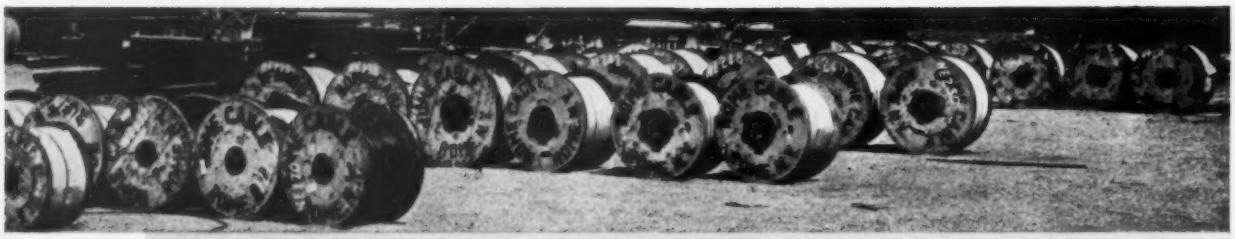
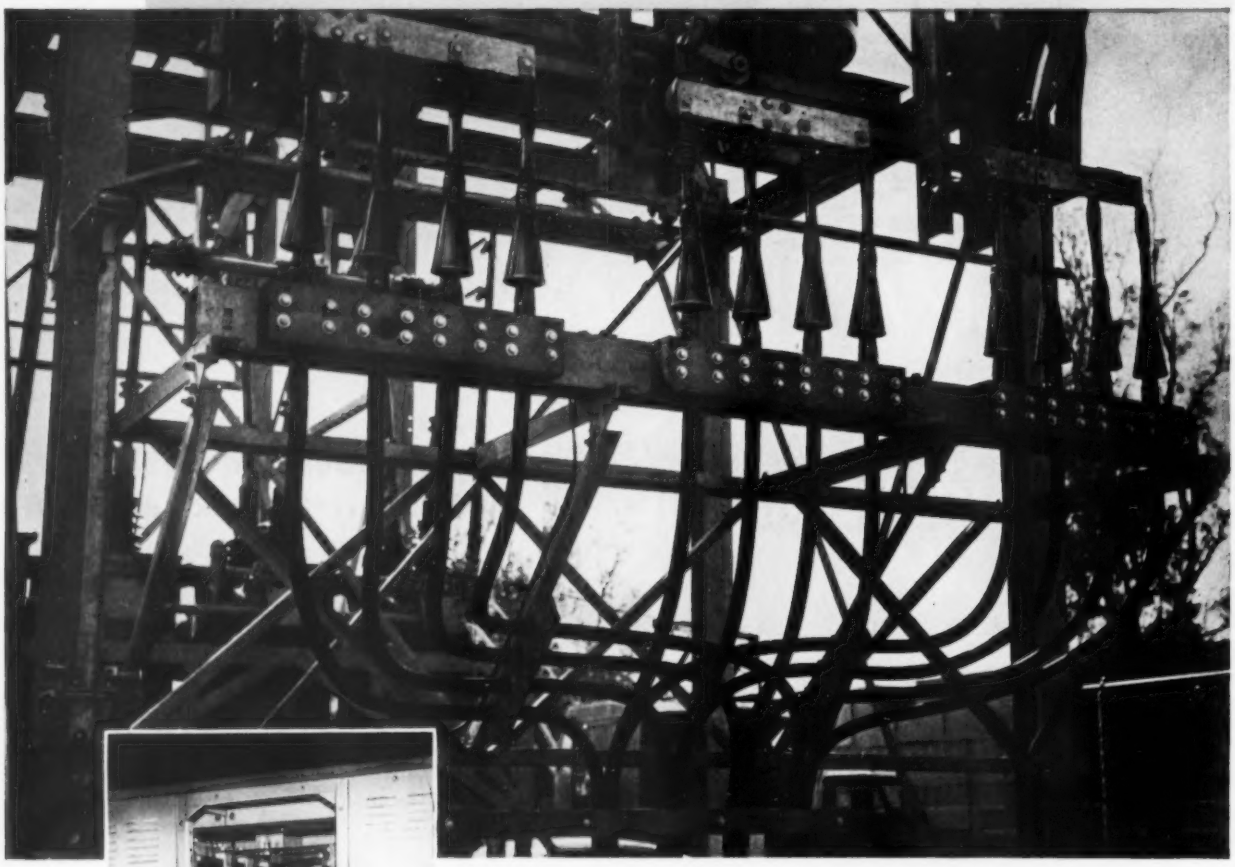
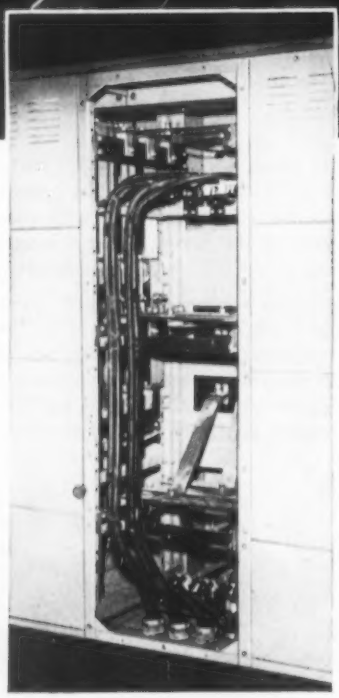
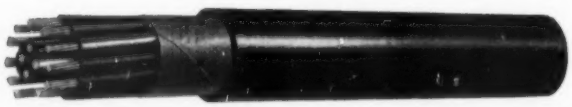




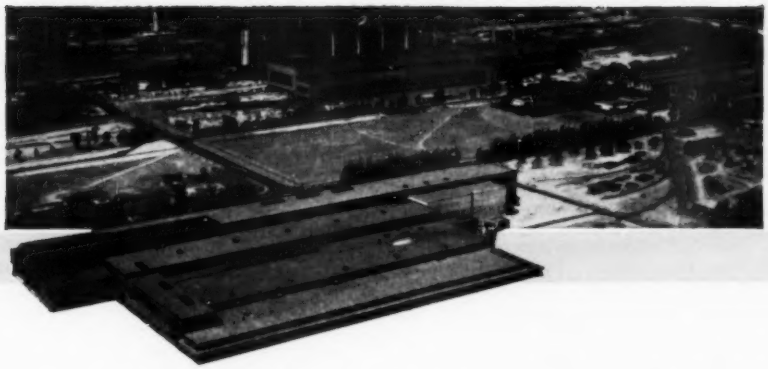


Outdoor connections at switch yard. Note manually prepared terminals.

The 600 volt cable for motor connections and single conductor control cable was RoMarine-RoPrene, style RR-D. All sizes from No. 12 to 1000 CM style RR-D were used for this service.



Multi-conductor control cable in this installation is RoLene (polyethylene) insulated and Rome Synthinol sheathed, described by Rome Cable specification CT-2.



Recently built Kaiser Steel Tin Plate Mill (left foreground), Fontana, California. Capacity is 200,000 tons of tin plate per year.

Electrical Contractor:
Kaiser Engineers, Inc.

How Kaiser Steel licked 3 tough cable problems all at once

In selecting power cables for 6.9 KV circuits at its new Fontana Tin Plate Mill, Kaiser Steel Corporation faced three knotty problems:

First, the hazard of acid and alkali corrosion was severe.

Second, the threat of electrolytic action was more than a possibility.

Third, termination and splicing costs were important factors.

Kaiser's choice for this service fell to single conductor, 500,000 CM Rome RoZone-RoPrene shielded power cable, insulated for 9 KV. Two sets were installed to connect the main substation with two 6,900 volt busses in the tin mill proper. Total connected load to the busses was 19,000 HP of M-G motors and 14,250 KVA of transformers.

Why RoZone-RoPrene

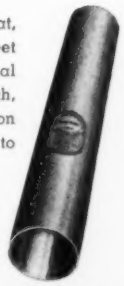
RoZone insulated, RoPrene sheathed cables offer maximum protection against acids, alkalies, oils, greases, moisture, heat, sunlight, and flame. They are non-metallic sheathed and require no lead sheaths with subsequent cathodic protection against electrolysis. Their RoZone (premium quality oil base) insulation provides exceptional resistance to corona action and ozone cutting.

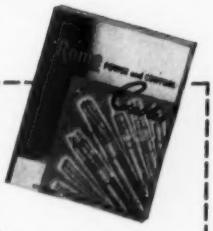
Simple manual terminations eliminate the need for regular wiped potheads. Standard splicing kits only are needed; no costly wiped joints. And the smooth surface of the RoPrene (Neoprene compound) sheath makes for easy working and pulling through conduits and junction boxes.

HELPFUL INFORMATION—Whether your electrical requirements involve special cable designs to meet severe service conditions or simple home wiring, consider the advantages Rome products offer from the standpoint of price and quality. For information that you may find immediately useful, send for the *Rome Power and Control Cable Catalog* illustrated below.

500,000 CM, single conductor shielded, RoZone-RoPrene power cable, rated at 9 KV.

To give wires and cables added protection against heat, moisture, corrosion and abrasion, several thousand feet are encased in Rome • EMT. This is a superior electrical metallic tubing, electrically welded for extra strength, with an electrogalvanized exterior surface for protection against corrosion and a mirror-smooth interior surface to prevent cable injury.





You'll get a wealth of helpful information from the Rome Power and Control Cable Catalog. It contains 65 pages of illustrated information, specification and test data on all Rome power and control cables and on famous Rome insulations. Mail the coupon for your copy today.

ROME CABLE CORPORATION,
Dept. PE-3, Rome, N. Y.

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It Costs Less to Buy the Best!

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For more facts circle 521 on Reply Card

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by E. B. Skubik

Sea Water Distillation

BECAUSE of the water shortages that affect many areas of the country and the recent shortages affecting some of our largest cities, renewed attention has been focused on obtaining an adequate supply of water for domestic, industrial and agricultural purposes.

Any new supply of water must come directly or indirectly from the sea, for this is by far the largest portion of water on the surface of the earth.

The chief objection to the use of sea water is its high dissolved salts content and the cost of separating or removing these salts so as to make this water suitable.

Until a few years ago all the commercial equipment manufactured for the distillation of sea water consisted of single or multiple-effect evaporators. Vapor compression distillation units have recently been developed through extensive research to permit efficient distillation of sea water with greater fuel economy than either single or multiple-effect evaporators.

While a single effect evaporator produces 14 lb of distilled water for one lb of fuel, and a triple-effect unit produces 36 lb of distilled water per lb of fuel, a compression distillation still gives 200 lb of distillate for one lb of fuel.

The process of vapor compression distillation operates on the principle of the heat pump in which the latent heat of vaporization is continuously reused by compression of the vapor.

The vapor produced at atmospheric pressure from the sea water is withdrawn from the evaporator shell, compressed, and returned to a condensing chamber in the evaporator. Here the latent heat is given up to evaporate more water.

By recycling the latent heat of vaporization a remarkable fuel economy is shown over other types of distillation equipment and the necessity for direct fired equipment is eliminated once the process is started.

Solar distillation of sea water may also be employed as a source of fresh water. While the method has not been widely developed, it does show promise for use in certain areas. *From The Betz Indicator, Published by W. H. & L. D. Betz, Philadelphia 24, Pa.*

Changes in Welding Current and Equipment Boost Production

EXTENSIVE experience in the manufacture of discplowing harrows has proved to the Rome Plow Company of Cedartown, Georgia, that they can produce more harrows, faster, by using certain types of electrodes and a-c welders.

The company fabricates, to their knowledge, the largest and heaviest discplowing harrows now made. These range in size from 450 to 9,900 lb.

Rome's production line is streamlined for maximum efficiency and all work is positioned to take advantage of the benefits of a-c welding.

According to Mr. Paul Wiener, superintendent, Rome switched from d-c to a-c welding after exhaustive tests had shown that a-c welding eliminated magnetic arc blow and permitted the use of larger electrodes at higher current settings, materially increasing production. *From an article by Ralph Baker in Welding Arcs, published by General Electric Company.*

Welders are seen working on gang carriers for discplowing harrows. Jigs are used to hold and position the work. Normally, an operator on one side of the flash shield tack welds the assembly while man on other side finishes job

Foundry Materials Handling

OF THE THOUSANDS of items which are purchased to maintain the life blood of the foundry, we have certain materials of sufficient bulk and quantity that will lend themselves to good materials handling methods.

In the past years, through negotiation with suppliers, we have arranged the palletization of our brick, and aluminum and bronze ingots, and assorted supplies. These pallet load shipments in railroad cars reduce tremendously the amount of cost involved in our unloading operations.

The transfer of dry sand shipments from hopper cars to bins has been improved to a great extent by the use of undercar belt conveyor unloaders that discharge the sand into buckets, which are then transferred by our yard crane to the overhead hopper or storage bins.

Many foundries today, when sufficient sand is purchased, have installed pits under their tracks whereby the cars can be unloaded into the pit onto an oscillating conveyor.

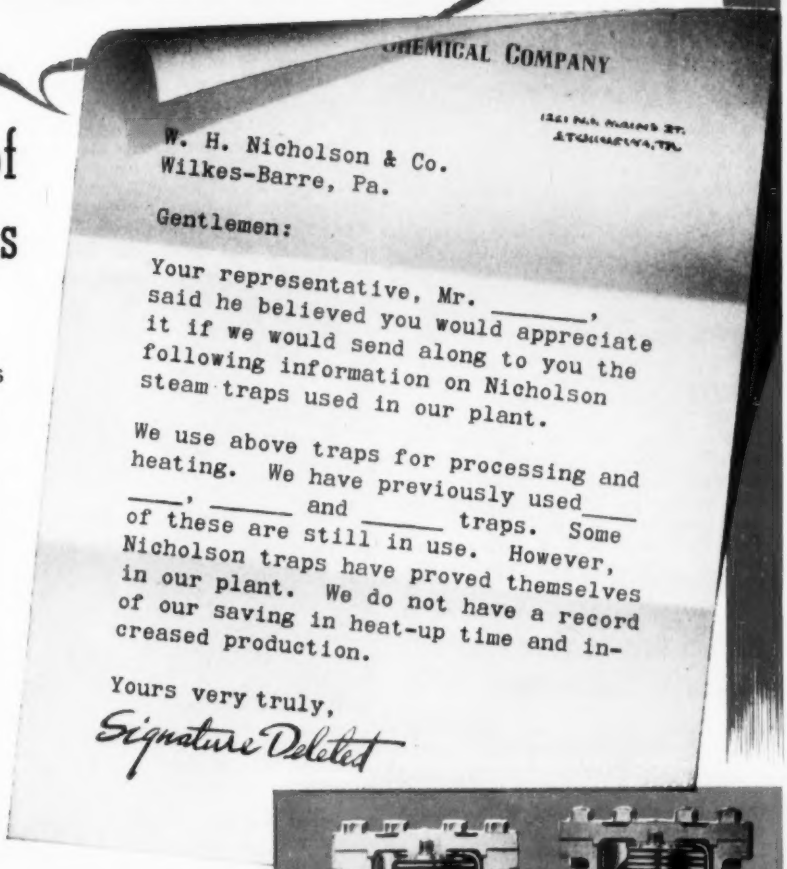
This discharges into an elevator adjacent to the sand storage silo, which carries the sand up and into the bin. The undertrack feeders and elevators are one of the most efficient methods yet devised.

Another popular system for the transfer of sand to storage bins is by use of the pneumatic conveyor system. This particular system is

"NICHOLSON TRAPS PROVE THEMSELVES"

..in plant of one of Big 6 chemical firms

The importance of improving heat transfer efficiency in today's great processing plants increases as the proportion of critical applications grows and steam consumption mounts. The letter at the right is from one of the great chemical companies which have adopted Nicholson traps. Another of them recently reported that Nicholson traps were installed at one of their plants as part of a campaign to promote economical steam use. It resulted in a yearly saving of $500,000. See why an increasing number of leading plants are standardizing on Nicholsons.



...HEMICAL COMPANY

...ATCHUNGA, PA.

W. H. Nicholson & Co.
Wilkes-Barre, Pa.

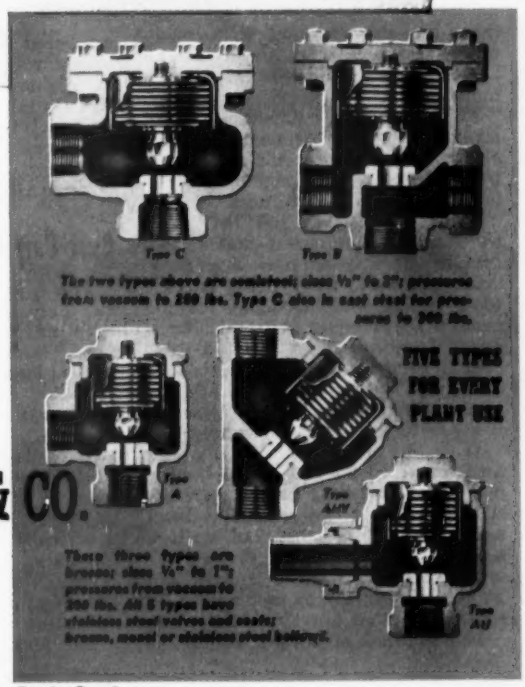
Gentlemen:

Your representative, Mr. _____, said he believed you would appreciate it if we would send along to you the following information on Nicholson steam traps used in our plant.

We use above traps for processing and heating. We have previously used____ ____, _____ and _____ traps. Some of these are still in use. However, Nicholson traps have proved themselves in our plant. We do not have a record of our saving in heat-up time and increased production.

Yours very truly,

Signature Deleted



Send for TRAP CATALOG 751

This 32-page standard reference is complete with installation diagrams as well as charts and formulae for determining proper size of trap.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

208 OREGON ST., WILKES-BARRE, PA.

Sales and Engineering Offices in 58 Principal Cities

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PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

not used as broadly in the foundry industry, but has significant merits which should be studied by anyone planning a change in sand unloading methods.

The handling of most scrap materials from the car to yard storage is usually handled by a traveling yard crane, gantry or bridge crane, with a magnet pickup. When this unloaded material is required for the melting operations within the foundry, it can be readily transferred to containers by magnet. Trucks and railroad cars can likewise be used for the transfer of stored materials.

Many foundries today are placing their raw material storage within the plant proper in a roofed-over yard or actually within the building, so that the cost of double transfers is eliminated and so that the raw material will be adjacent to the melting operation. Wherever this plan is feasible, it is considered the most practical. *From an article by Paul P. Winters of G. E. Erie Foundries, in Load, published by the General Electric Co.*

Machine Uses Abrasive Belts To Sharpen Carbide Tools

A NEW METHOD of sharpening tungsten-carbide cutting tools, without a diamond wheel, costs approximately ⅔ less per tool sharpened than the conventional diamond-wheel method, and produces a longer lasting cutting edge on the tool.

The machine for the new method uses as a grinding element a coated abrasive belt that travels over a cast iron contact wheel specially formulated for extreme hardness.

Field tests show that belt costs for sharpening tungsten-carbide tool bits range between one and three cents per tool. Sharpening carbide tools by the conventional method costs 6 to 17 cents per tool sharpened. In addition to this two-third reduction in cost of materials, the abrasive belt procedure eliminates two traditional steps without sacrificing cutting tool performance.

With the new method, the intermediate grind and the finish-honing operations are no longer necessary. After the clearance angle has been rough-ground on the tool with a silicon carbide wheel, the relief angle and final cutting surface can be micro-finished in one operation with the coated abrasive belt.

The method of setting the relief angle on the cutting tool with this machine is new to the tool grinders' trade, and reflects simple but ingenious design. The relief angle is set by adjusting the height of the table until the face of the cutting tool contacts the belt on the periphery of the contact wheel at a point on its curvature that corresponds to the relief angle desired.

A vertical gauge, marked in degrees from one to 22, is accurately mounted near the table at the left of the wheel. Proper table height is established for a desired relief angle by aligning the cutting edge of the carbide tip with the correct angle marking on the vertical gauge.

The new machine is being operated currently in demonstration rooms in 16 major industrial cities across the country. After seeing this new development demonstrated, leaders in the abrasives industry

Inventor of machine, Mr. Lindmark, holds the tool against a post which is calibrated in relief angles. Table can be adjusted to desired height setting

predicted that this new development would relieve the critical shortage of diamond grinding wheels and would make tungsten-carbide tipped tools practical for many shops which cannot afford diamond wheels. *From a release of Harry W. Smith Incorporated, New York 17, N. Y.*

Dust Particle Measurement

THE ASME code defines a dust as gas and air borne particles larger than one micron in "mean diameter." Some of the municipal ordinances have defined a dust nuisance as being made up of gas and air borne particles larger than 10 microns.

The efficiency of the mechanical collector drops off rapidly as the particle size decreases below 10 microns. It is well then to know specifically what is meant by "mean diameter." The particles of fly-ash are certainly seldom regular spheres but comprise a heterogenous dust consisting of irregular shapes.

The term "mean diameter" of an irregular shaped particle is assumed primarily to be the diameter of a sphere which would behave the same as the particle under the same circumstances.

In sedimentation or elutriation, for example, the principle used is that a particle falling with a certain velocity is assigned a mean diameter which corresponds to the diameter of a sphere that would fall at the given velocity calculated from Stoke's law.

In the sieving analysis, a particle that will just pass through a 325 mesh (Tyler) sieve is assumed to have a diameter of 44 microns because the apertures are square, averaging 44 microns on a side.

Irregular-shaped particles will have different behavior characteristics under different circumstances and the analysis by one method will not agree in particle size with that of another method.

For instance, a particle shaped like a flat disk may be classed as a large size in the sieving method, but because it settles slowly in sedimentation, it would be classed much smaller in diameter by the latter method.

There is also the danger of reducing the size of the particles by attrition while determining the particle size.

The expected or guaranteed collection efficiency of a collector must therefore be based not only on a given particle size distribution, but the method of determining the particle size must also be stated. Thus, it can be seen why a standard test code is needed. *From a paper presented by B. S. Norling, published in Air Repair, a publication of Air Pollution Control Association, Pittsburgh 13, Pa.*

Turbine-Driven Pump Load Loss

TURBINE-DRIVEN pump accidents frequently begin with a loss of load. When the turbine load is suddenly dropped an upward surge of speed follows. If the speed limiting controls fail to operate quickly in the emergency, the pump and turbine suffer damage from overspeed, and may explode.

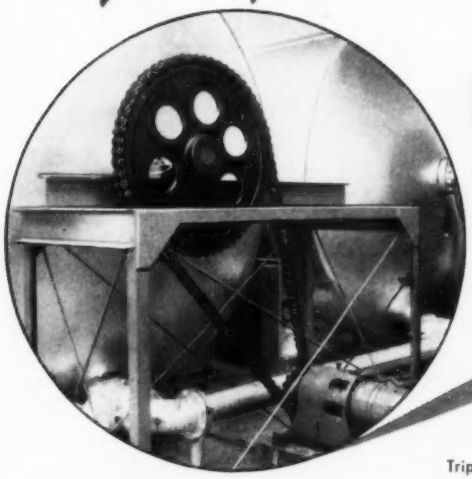
Factors that can cause a sudden loss of load or loss of prime should, of course, be given serious consideration when planning the location of a pump and its piping hook-up; and the pump-maintenance program should include special care of valves that might cause loss of prime by their failure.

Since load may be lost in some unexpected manner, the surest means for preventing overspeed accidents from this cause is to maintain speed control devices in top condition.

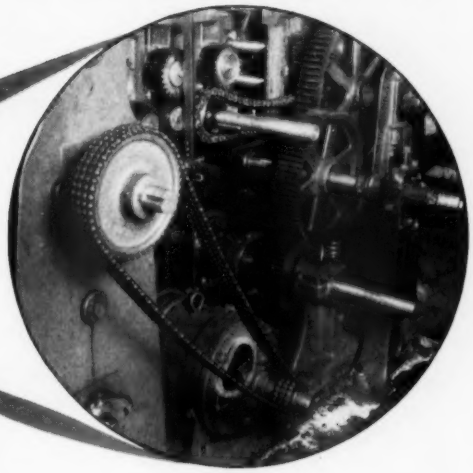
Speed limiting governors and their valves are seldom called upon to function, especially on pumps controlled by pressure governors.

In your plant, too

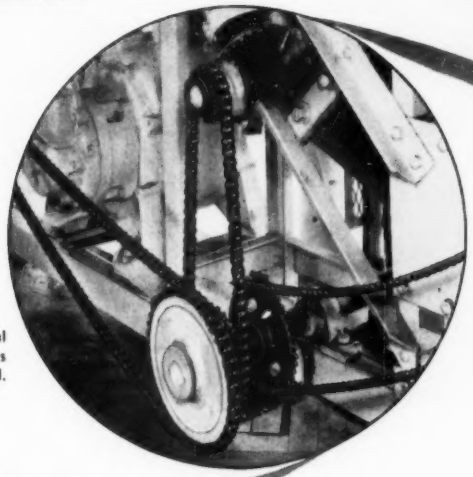
there are many jobs DIAMOND ROLLER CHAINS can do most effectively



Agitator drive 5-ft. center distances. Exact slow speed of agitator assured. (Guard removed to show No. 478 Diamond Roller Chain).

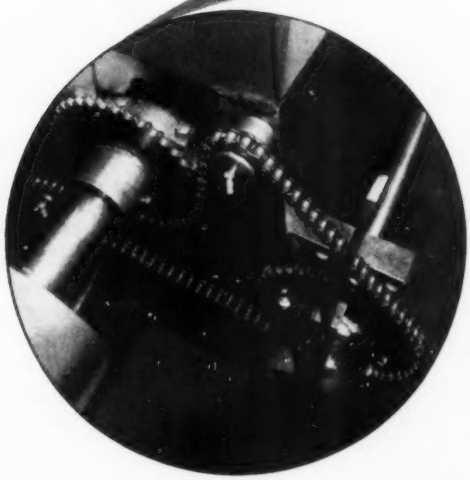


Triple strand chain from motor with another shaft to shaft drive above.



Power source to several shafts at speeds selected as required.

Plant drive in wire mill—driven shaft above is rotated in opposite direction to driving shaft (below).



• For high speed drives from motors, drives from shaft to shaft or one shaft to several others, Diamond Roller Chains provide ideal operation. They are non-slipping, highly efficient (98-99%) and insure reliable top output for many, many years of service.

You will find many applications in your plant where Diamond Roller Chains can serve you. Catalog 709 gives basic chain and sprocket data—copy on request.

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Indianapolis 7, Indiana
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Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

Shot-Peening Since 1944

Diamond Chain has long recognized that certain types of internal stressing of chain parts would increase fatigue resistance. To this end, link plates have been specially processed and chain rollers and other parts have been shot-peened since 1944.

DIAMOND ROLLER CHAINS

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1 man does the work of 5

with a **TENNANT POWER SWEEPER**

PAYS FOR ITSELF. In a plant like this a Tennant Power Sweeper easily pays for itself in about 4 to 12 months.

Put just 1 man on a TENNANT Power Sweeper and he'll usually sweep *more* than a 5-man crew . . . do a cleaner job . . . and cause less disturbance in your busy aisles.

This fast, labor-saving performance is reported by hundreds of plants in many industries. And it's made possible by *EXCLUSIVE engineering features* . . . things that make it extra-easy for 1 man to replace a 5-man sweeping crew—or more.

NEW FEATURES SAVE TIME

REVERSES INSTANTLY. Saves time; no hand shifting of gears. Single pedal controls forward and reverse.

TURNS "ON A DIME." Lets you get in and out of tight corners in fraction of usual time. Extra-easy to steer and control. Rear wheel automotive steering.

SWEEPS FAST; EXTRA CLEAN. Has maximum capacity exceeding 90,000 sq. ft. per hour. Powerful vacuum-brush system even gets dirt from many cracks, crevices.

FOR CLEAN, LOW-COST SWEEPING where battery power is desired, here's the Tennant Model 36 Electric Sweeper.

It's NEW . . . does the work of a 3 to 8 man crew . . . sweeps full shift on one charge (36 v. battery). *Ask for bulletin.*

Write Today! Learn how much YOU can save with a Tennant Sweeper.

FREE!

An accurate estimate of savings your plant can make

It's yours for the asking—an accurate graph of your present sweeping costs . . . and how much you may save each month with a Tennant Power Sweeper.

Shows how soon a sweeper *pays for itself.* Get this graph today. No cost or obligation.

TENNANT Established 1870

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CREATORS OF THE TENNANT SYSTEM OF FLOOR MAINTENANCE—MANUFACTURERS OF EQUIPMENT AND MATERIALS FOR MAINTENANCE OF FLOORS, DECKS, ROOFS, HIGHWAYS

Offices in Principal Cities

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PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

As a consequence of their inactivity, linkages, stems and other moving parts of the mechanism may become fouled with dirt or rust, and may stick when called upon to act in an emergency.

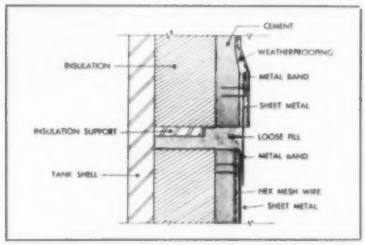
Only by regular and frequent maintenance and by testing moving parts to see that they operate freely throughout the full length of their travel can speed limiting devices be counted upon to act quickly enough to keep the turbine speed under control when the pump suddenly loses its load. *From The Locomotive, published by the Hartford Steam Boiler Inspection and Insurance Company, Hartford 2, Conn.*

Expansion Joints in Insulation

FAILURE to provide for expansion of heated vessels has caused more damage to insulating materials than all other causes combined. Expansion joints are an expensive luxury if a vessel doesn't actually need them, but a real necessity if it does. Ordinarily, little emphasis is placed on expansion problems for process equipment that operates under 250 F.

Expansion is a real problem since today's trend is towards larger and comes greater as vessel sizes increase.

Normally, both longitudinal and

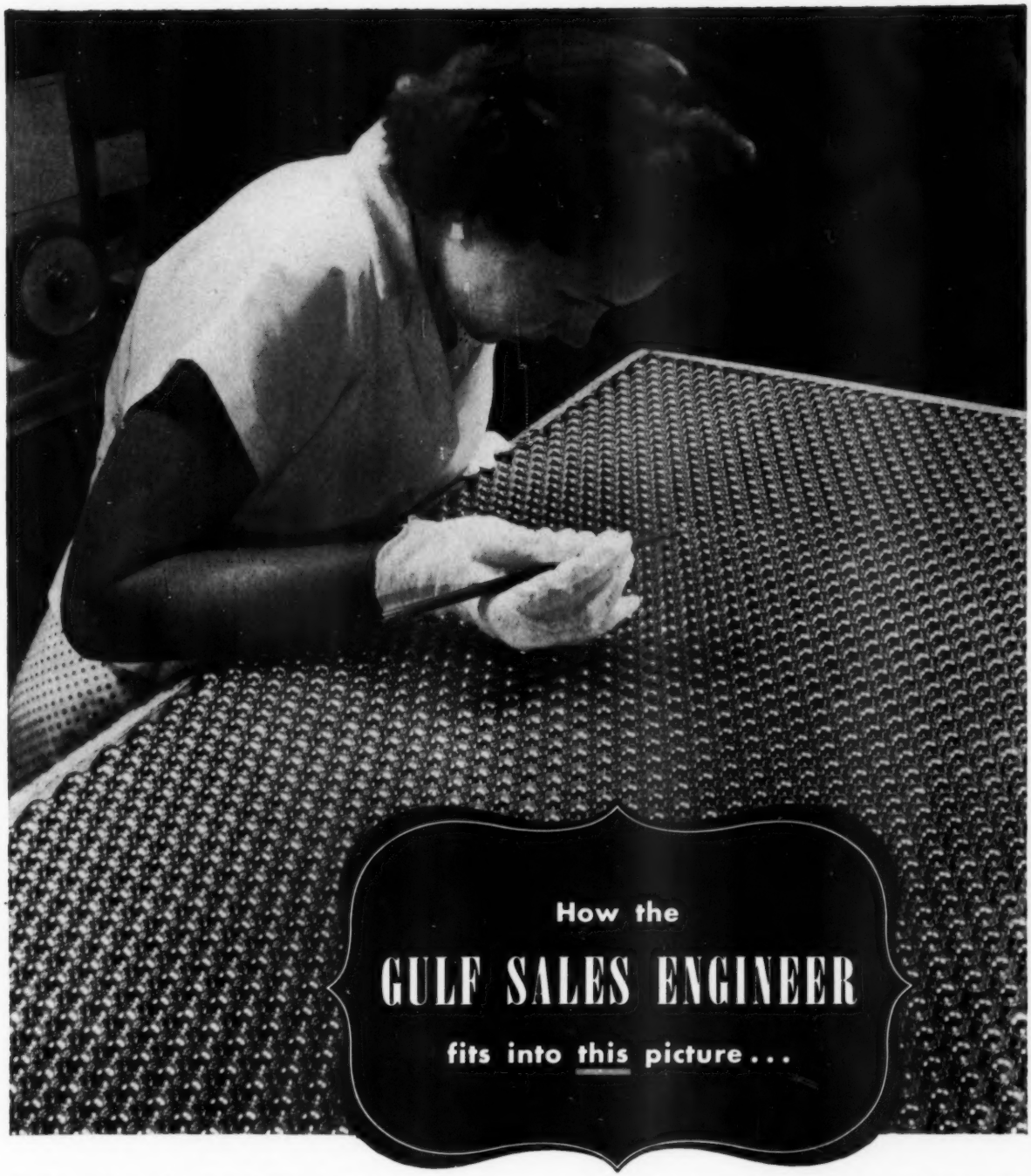


This is a view of a vertical expansion joint. Two flashings of sheet metal overlap about 2 in. Steel bands and tie wires are used to hold the sheet metal

circumferential expansion must be considered in every vessel. However, since the majority of process vessels and towers are far taller than they are wide, longitudinal or linear expansion is of primary importance.

Flashed expansion joints at the insulation support rings are the best means of allowing for linear expansion on both vertical and horizontal equipment.

One example of a vertical expansion joint is offered by the figure. Two aprons or flashings of sheet metal are overlapped about 2 in. and secured at top and bottom to



Surfaces like mirrors and every ball the same size —within a few millionths of an inch! Both requirements must be met by these hardened steel balls for antifriction bearings.

However, retaining these characteristics during shipment and storage is sometimes a problem, particularly under moist atmospheric conditions where rust may occur. And that's the clue to why the Gulf Sales Engineer belongs in this picture.

On many types of rust and corrosion problems, like that suggested here, the Gulf Sales Engineer can be very helpful—he offers quality rust preventives and information on their application and removal. If you have a corrosion problem in connection with metal parts, get in touch with your nearest Gulf office. Gulf Oil Corporation · Gulf Refining Company, Pittsburgh 30, Pennsylvania.

GULF SERVES INDUSTRY

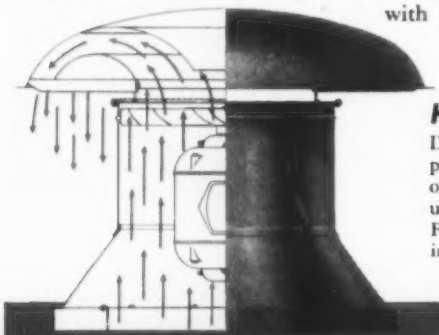
For more facts circle 525 on Reply Card

(Photo courtesy of National Biscuit Company)

Smart Cookies (LIKE NABISCO CALL FOR Controlled Ventilation

At Portland, Oregon, the modern National Biscuit Company plant is one of the most scientifically equipped food producing establishments in the world. But you can imagine how hot it could get around ovens that turn out several million cookies a day! Plant designers Ford, Bacon and Davis anticipated the need for exhausting hot air caused by baking processes, and came up with the right recipe. 42 DeBothezat Power-Flow Roof Ventilators, each with 21″ fan wheel and 1 HP totally enclosed air-over motor, were installed over the oven area. 19 Power-Flows with 27″ fan wheel and 1 HP motor were installed above the packaging and shipping areas. Altogether these 61 Power-Flow Roof Ventilators exhaust more than 445,000 cubic feet of air per minute. Controlled ventilation assures good working conditions, and is in keeping with the high standards of NABISCO operation and sanitation.

Certified Ratings CP PFMA



HOW ABOUT YOUR PLANT?

DeBothezat Power-Flow Roof Ventilator is a motor-driven fan in a weatherproof housing, for use with or without duct systems, either for air exhaust or intake. Available with fan wheels 12″ through 48″ in diameter, delivering up to 40,900 CFM. Low, streamlined design blends well with all architecture. For catalog containing illustrations, specifications and certified capacity ratings, write our factory, Dept. PE-353, or phone your local DeBothezat agent.

Power-Flow ROOF VENTILATORS

Built by **DeBothezat Fans**

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

For more facts circle 526 on Reply Card

BULLETINS just released and of immediate plant interest

MECHANICAL POWER TRANSMISSION

101 **Variable Speed Drives**—Catalog M-521 is a 52-pp ordering book and manual on company's Vari-Speed Motodrives, constant torque variable hp units in sizes from ¼ to 25 hp. Illustrations include cutaway drawing in color showing design details, and photos and dimensional drawings of various models. Covers integral hp variable speed units, fractional hp units, right angle drives, modifications and special controls and accessories available. Arranged for easy use, book includes ratings, sizes, prices, weights and a section of engineering information helpful in determining correct drive. Reeves Pulley Co.

102 **All-Steel Pillow Blocks**—In Bulletin A-620, 8 pp, colorful illustrations show features of new all-steel Dodge-Timken pillow block. Technical information of value in determining whether this new pillow block will solve a particular problem is provided, along with selection information helpful in arriving at the proper size. Data cover pillow blocks in sizes from 2-15/16 to 10 in. Dodge Mfg. Corp.

103 **Simplified Data on V-Belts**—Form 3787 is an 8-pp catalog on V-belts for industrial use. Features simplified conversion tables for determining which of company's belts is the correct one to replace belts of other manufacturers. Prices, dimensions, weights and construction details presented. Thermoid Co.

104 **Magnetic Pulleys** — Eight-pp illustrated Catalog 152-E covers high power magnetic pulleys, explaining operation and applications, design and construction features. Includes dimensions, capacities, and tips on selection of correct size pulley. Magnetic Engineering & Mfg. Co.

105 **Thyratron Motor Control** — Company's Thy-mo-trol drive is described in two new bulletins. A simplified drive for ¾- to 3-hp applications is discussed in Bulletin GEA-5829. Photos and diagrams explain the system which is designed for use on testing equipment, conveyors, variable volume or proportioning pumps and similar equipment. Bulletin GEA-5827 describes a precision-controlled drive for ¾- to 10-hp applications including machine tools and processing equipment. General Electric Co.

106 **Why Fully Crowned Teeth** — Seven major engineering advantages of fully crowned teeth in gear type flexible couplings are described in Bulletin 1052. Applications of Amerigear couplings for the solution of power transmission problems such as excessive offset or angular misalignment, space limitations, high speeds and torque loads, are shown. American Flexible Coupling Co.

107 **Helical Gear Drives** — Advantages, fields of application and correct selection of helical gear drives are discussed in 16-pp Book 2451. Full-page cross-sectional views show design and construction features of both double and triple reduction types, and installation photos are provided, too. Selection factors are described in detail, horsepower ratings given, and load classes for 170 types of machines tabulated. Link-Belt Co.

108 **Coupling or Converter**—To promote a better understanding of hydraulic couplings and torque converters, this 32-pp publication tells where couplings or torque converters should be used, and why, furnishing a source of facts in non-technical terminology. Covers meaning and characteristics of torque and its effect on driving and driven equipment. Explains why a hydraulic coupling transmits only input torque, and a hydraulic torque converter multiplies torque, giving advantages of each type drive. Twin Disc Clutch Co.

PUMPS, PUMPING

109 **Solids Handling Pumps** — Bulletin Pb-52, 20 pp, introduces a line of pumps for solids and acid handling. These pumps operate on a vacuum-seal principle to prevent fluids or entrained solids from being forced into the gland. Design principle is illustrated and advantages explained. Rubber lined and all metal types in sizes from 2 to 8 in. are presented in detail along with capacity data, velocity and head loss tables and instructions on the selection, installation and operation of the pumps. The Galigher Co.

110 **For Pumping Viscous Liquids** — A multiple V-belt drive pump unit for handling heavy fuel oils and other non-corrosive viscous liquids in circulating and transfer service is introduced in 8-pp Catalog 107. Illustrates typical applications, gives dimensional data. Tuthill Pump Co.

111 **Heavy Duty Rotary Pumps**—Sixteen-pp Bulletin W-483-B2, covering both herringbone gear type pumps with capacities to 500 gpm and pressures to 100 psi and sliding-vane type with capacities to 1000 gpm and pressures to 200 psi, is complete with fields of application, coverage charts, mountings and dimensions. Engineering data provided include a viscosity conversion table, relation of API hydrometer scale to specific gravity, and viscosity-temperature chart for fuel oils. Reciprocating Pump Div., Worthington Corp.

112 **Pumping Equipment Ordering Guide** —Eight-pp Bulletin 10051-B presents a line of pumps and valves for fluid power systems. Illustrated with photos of various models, covers variable delivery and constant delivery pumps, duplex pumps, small pumps, feed pumps, and their controls. Also includes variable speed transmissions, motors and cylinders. Gives applications, design features, dimensions and specifications. The Oilgear Co.

ELECTRICAL, LIGHTING

113 **Instrument Transformer Buyer's Guide**—Publication GEA-4626F is the 1953 edition of company's book on instrument transformers and contains basic, up-to-date information on the complete line. The well-illustrated 102-pp guide provides ratings, ASA accuracy classifications, and prices of indoor and outdoor potential and current transformers. Listings of ratio and phase-angle tests, together with tables covering mechanical and thermal limits of current transformers included. General Electric Co.

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March, 1953

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Use this space to ask for tear sheets, other information wanted.

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114 **Magnetic Air Circuit Breaker**—Design and construction features of the Ruptair magnetic air circuit breaker for installation in vertical lift switchgear rated 4.16 kv are described in Bulletin 18B6346B. It diagrams way in which the breaker interrupts short circuit current and describes purposes of the arch chute and the efficiently integrated contacts. Includes table of ratings. Allis-Chalmers Mfg. Co.

115 **Carbon Brushes for FHP Motors**—Catalog 61 is a 66-pp carbon brush data book for fractional horsepower motors giving complete information on brush replacement. Indexed, well illustrated and easy-to-use, this book lists replacement brushes under the appliance manufacturer's name as well as under the motor manufacturer's name. Becker Brothers Carbon Co.

116 **Power Distribution Practices** — The 28-pp "Industrial Power Distribution Idea Book" (Bulletin GEA-5900) is a guide for plant engineers on electric power distribution practices in large and small plants. Covers utility distribution practices; methods of buying power; what to do when a choice of primary voltages is available; application of primary switches and circuit breakers; types and arrangements of primary cables; and types of load-center distribution systems. Also discusses branch feeder switches, starters, and fuses, grounding of systems, interrupting capacity. General Electric Co.

117 **Audio-Radio-Television Electronics** —This 24-pp booklet gives design features, specifications and prices of company's line of amplifiers, public address systems, television boosters and allied equipment. Also describes a specially designed sound and intercommunication system to meet individual requirements of industrial plants and institutions. David Bogen Co., Inc.

118 **X-Ray Trouble Chart**—This 11 by 15 in. chart is titled, "Locating Common Electrical Faults in X-Ray Generators." Lists symptoms, suspected location, trouble possibilities and methods for locating and correcting generator troubles common to all makes of X-ray equipment. Research & Control Instruments Div., North American Philips Co., Inc.

119 **Electrical Tapes** — This 12-pp illustrated booklet on electrical tapes and related products discusses use of company's plastic electrical tapes in wiring, appliance repair, underground cable splicing and other heavy duty applications. Tells how a glass cloth electrical tape with thermosetting adhesive is used where high temperatures are involved. Describes electrical spring connectors for splicing, an electrical insulation putty, and a protective outer coating for plastic tapes. Minnesota Mining and Mfg. Co.

120 **Fluorescent Luminaires** — Booklet B-5790, a 24-pp pocket size catalog of fluorescent luminaries, gives detailed descriptions accompanied by photos and diagrams of each luminaire. Tells where respective types are best applied, what models are available, features of each and dimensions. Westinghouse Electric Corp.

INSTRUMENTS, CONTROLS

121 **Industrial Controls** — Complete information on a line of industrial controls is available in 32-pp Catalog P 3941-2. Covers control terminology, thermostats, proportioning pressure switch, humidity controls, types of valve bodies, motor-operated valves, solenoid valves, valve capacities, temperature regulators, control motors, relays, electrical accessories, heating and air conditioning controls. Fully illustrated, includes application information. Barber-Colman Co.

122 **Recorders, Controllers**—Catalog 1550, 24 pp, describes and gives details on measurement and control of pH, Redox and conductivity. Includes easy-to-understand theory behind electro-chemical measurement, and gives up-to-date information on recorders, controllers, amplifiers and electrodes. Also contains information on where and how to use automatic pH, Redox and conductivity measuring and controlling equipment. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

123 **Control Centers**—Multi-unit control centers are featured in 28-pp Bulletin 798 which provides a complete explanation of their purpose and construction and includes unit dimensions, ratings and typical applications. In a section titled, "Pattern for Planning a Control Center," layout charts and floor arrangements are illustrated. Allen-Bradley Co.

124 **Temperature Control Manual** — A guide to industrial temperature measurement and control, newly-revised 24-pp Bulletin 110 presents basic principles of industrial temperature control. Defines and evaluates types of systems. Discusses ways of responding to temperature and ways of putting that response to work, also basic instrument types. Clarifies the sometimes-neglected subjects of influence on firing system on design of control system, principles of mercury-bulb installation, and electrical and mechanical control theory. Typical control circuits and piping systems shown. The Partlow Corp.

125 **Gas Meters** — Sixteen-pp Bulletin M-152 describes meters for measuring gases of any type, and in quantities from 4000 to 1,000,000 cu ft. In addition to detailed descriptions and illustrations of the various types of meters, booklet contains a selection table for determining meter required for any load, whether at standard or variable conditions of temperature and pressure. Roots-Connersville Blower.

126 **How to Select Regulators**—This new 36-pp, illustrated "step selection chart" simplifies choice of proper type and size of pressure regulator, temperature regulator or pump governor to do a specific job. Written in non-technical language and supplemented by steam, gas and water capacity tables, this booklet includes installation suggestions, conversion tables and other data. Foster Engineering Co.

VALVES, TRAPS, PIPING AND ACCESSORIES

127 **Pinch Type Valves**—Catalog FL 382, 28 pp, presents pinch type flexible valves described as particularly adaptable to sand and water solutions, abrasive and corrosive fluids, other hard-to-handle materials. Explains construction, stresses advantages, and gives detailed data on both hand- and diaphragm-motor operated types. Includes selection information, installation and mounting diagrams, charts of construction material recommendations for a wide range of services. Farris Flexible Valve Corp.

128 **Disc-Type Valves**—Bulletin 1000 is a 16-pp catalog providing illustrations, operating and circuit diagrams, and dimensions and weights of manufacturer's line of valves. These are valves embodying disc-type construction and used for operating air and hydraulic cylinders, single and double acting, and air motors. Ledeen Mfg. Co.

129 **Cast Steel Valves**—Now available is a 56-pp catalog on cast steel valves. In-

(Continued on page 197)

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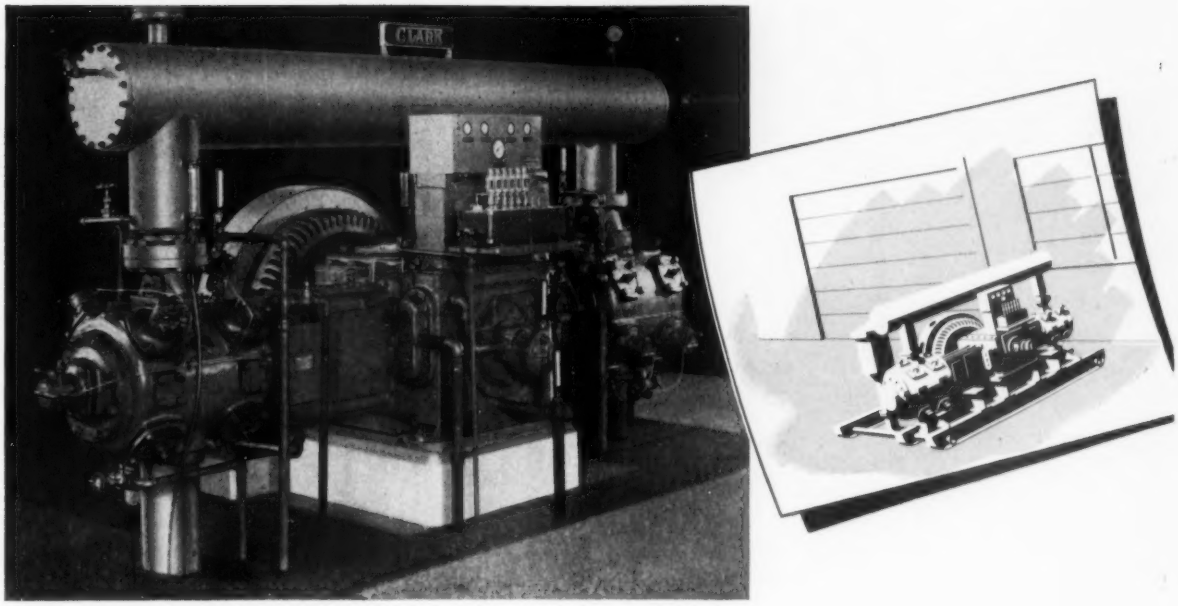
Need to replace a compressor?

HERE'S HOW TO AVOID PRODUCTION LOSSES DURING CHANGEOVER



Clark 150 hp, CMA-2 Balanced/Opposed Motor Driven Compressor in a Pennsylvania metal forging shop.

Normally, replacing an old or inadequate compressor involves either serious losses in plant air capacity during changeover, or requires a building addition to house the new unit. Such dislocation and unnecessary expense can be avoided with a Clark Balanced/Opposed Compressor.

Because of perfect balance and overhung rotor construction, it's a simple matter to mount an average size Clark unit on a steel skid and operate it outside of the compressor building, while the old unit is being torn down and the foundation is completed for the new one. When ready to change over, the new unit is easily taken inside — skid and all — bolted down to the new foundation and tied into the existing piping facilities. *A weekend is usually enough for the job!*

Furthermore, the compact design of the Clark Balanced/Opposed Compressor enables doubling — *even tripling* — air capacity, using the same floor area occupied by outmoded, inadequate compressors.

For air compressors within the 150 - 4500 hp range, write for Bulletin 118 or see your nearest Clark representative.

CLARK BROS. CO., OLEAN, N. Y.
Division of Dresser Operations, Inc.
Sales Offices in Principal Cities Throughout the World

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balanced/opposed compressors

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this will STIMULATE you

PETRO A.A.R.
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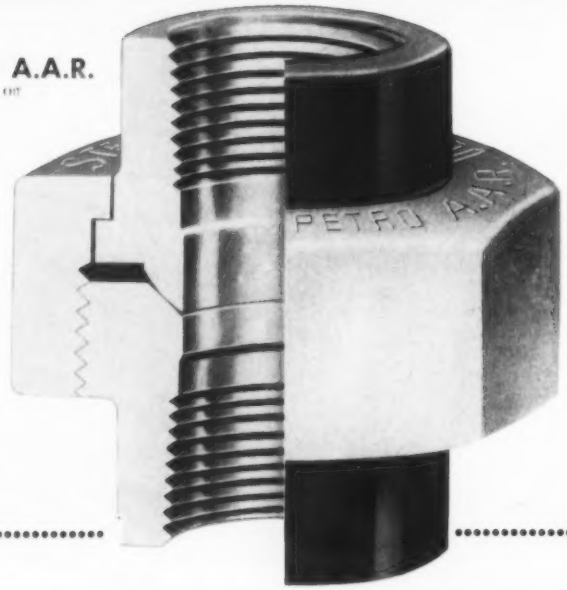


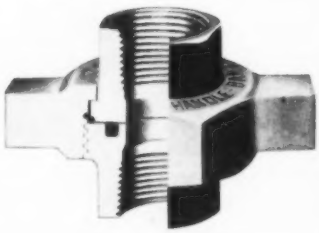
"PETRO A. A. R." Hot Forged of A. I. S. I. 1023 Open Hearth "Killed" Steel—for temperatures from 100° below zero F. to 1000° above zero F. A differential of 40 points (brinell) in hardness is maintained between the male and female seats to prevent seizure of seats at high temperatures.

Nut threads are permanently lubricated with Udylite Cadmium (plated). "PETRO A. A. R." screwed and "PETRO A. A. R." socket weld are recommended for severe service on ammonia, air, gas, oil, steam, and water, and for general industrial and oil refinery maintenance.

HANDLE-BAR "O" RING
Forged Steel

HANDLE-BAR "O" RING unions do not depend on compression or force, as the terms relate to common gasket type unions. A positive pressure seal is effected with a synthetic oil-resistant "O" Ring set in a groove between the two mating surfaces. Hand tightening of the nut will hold the rated working pressure.

The "O" Ring will not drop out when union is disconnected. However, the "O" Ring is replaceable, and at a very low cost. Our standard compound No. A-70 "O" Ring is recommended for cementing, mud, crude oil, lube oil, Natural Gas, and water services, and will work satisfactorily on acidizing, fuel oils, kerosene, and gasoline. Special "O" Rings are available for all services and temperatures up to 500° Fahrenheit.



Sizes ½" thru 3"
500-3000 C.W.P.
Max. Temperature 212° F.

For additional information about these and other Forged Steel Unions write Department P, for Illustrated Catalog or refer to listings in Composite Catalog pages 3194-3195, Refinery Catalog page 695, and Chemical Engineering Catalog pages 1294-1295.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

the insulation with steel bands and tie wires.

Expansion joints on horizontal tanks, are much the same as those on vertical vessels. A protective flap of roofing felt, hardware cloth, and weatherproof plastic overlaps the expansion joint.

An overlapping shield of sheet metal covers this construction. As in vertical tanks, moisture is sealed out and the tank can move without damage to insulation.

An air space between the insulation and the tank shell is one of the most common means of allowing for circumferential expansion. In order to allow the proper space it is necessary to know how much a vessel will expand in circumference.

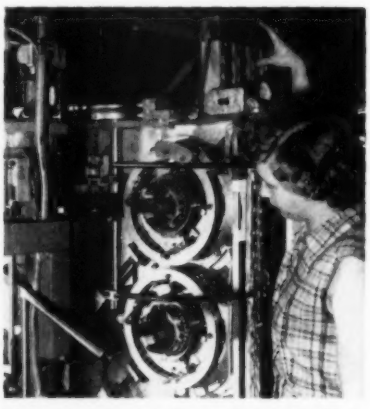
To allow for circumferential expansion either wood strips of the proper thickness or rope of the required diameter can be placed between the insulating blocks and the tank shell as the insulating material is being applied.

After the insulation is secured with metal bands, the strips or rope are moved up for the next ring of insulation.

Adequate forethought on expansion problems can prove to be a real saving in both longer life and lower maintenance cost once the job is in operation. *From Armstrong's Insulator, published by Armstrong Cork Co., Lancaster, Pa.*

Machine Sets Starting Windings

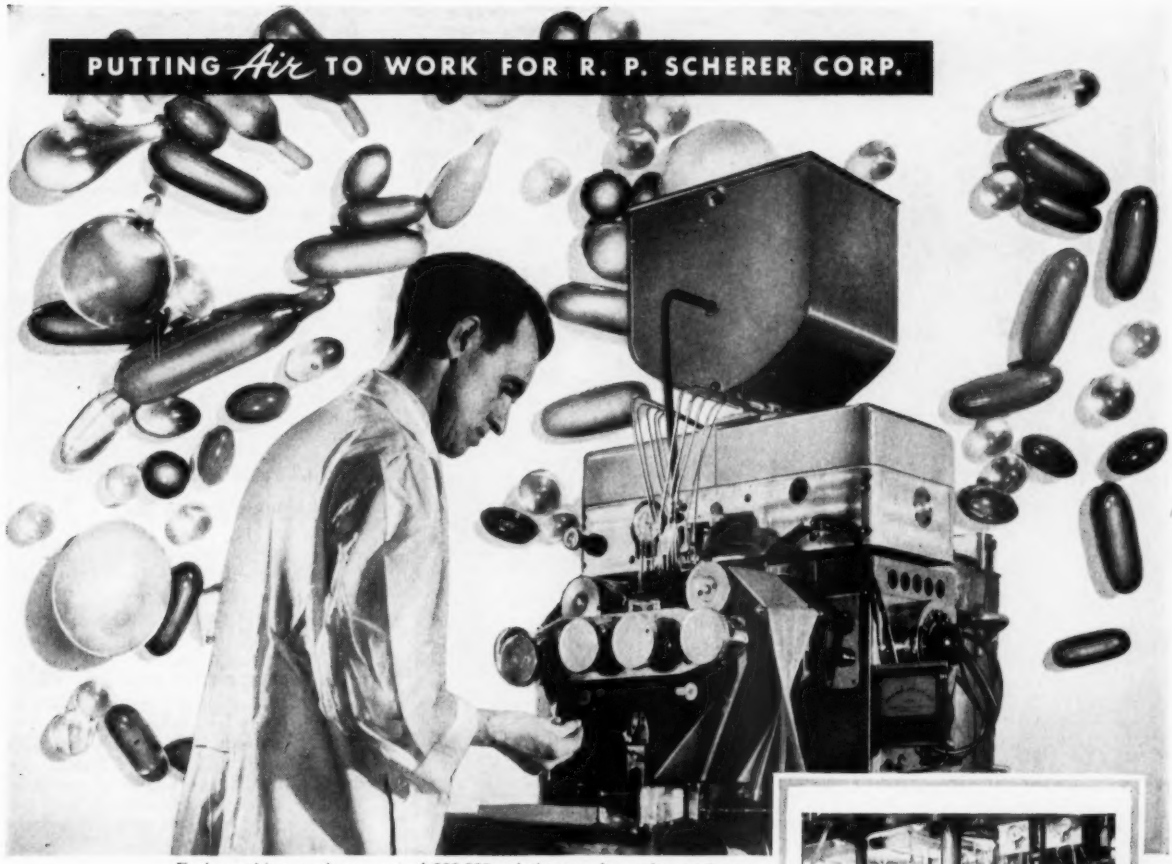
RUNNING WINDINGS are normally placed in the stators of fractional horsepower motors by machine, but



This machine places running as well as the starting windings in motor stators

starting windings have been inserted by hand.

A machine, installed in the Lima,



Each machine produces up to 1,000,000 gelatin capsules a day, and controlled atmosphere is a "must" to assure dependable production schedules.

KEEPING CAPSULES IN CADENCE FOR

9 TROUBLE-FREE YEARS

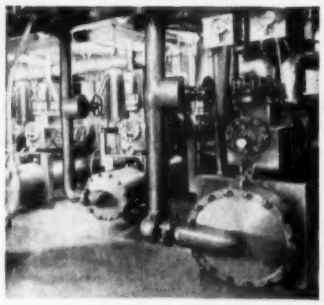
Capsules . . . capsules . . . capsules—name your size, shape and color! They turn out millions a day filled with anything from vitamins and medicine to lighter fluid and insecticide here at R. P. Scherer Corp. in Detroit. But watch out for moisture-laden air. Until they're dried, these soft gelatin containers are regular little water magnets.

The answer? Rigid, unvarying control of temperature and humidity 24 hours a day, seven days a week! It takes really dependable equipment for these unusual requirements. That's why Westinghouse Air Conditioning was selected.*

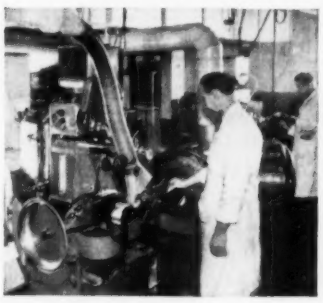
The result? For nine years their Westinghouse system has operated continuously without a single shutdown caused by mechanical failure. This full-time service equals *forty years* of normal service on an equivalent comfort air conditioning system.

Whatever your process involves in the way of a controlled climate, we can help you *put air to work* with air conditioning, air cleaning and air handling equipment. Call the Westinghouse Air Conditioning Distributor listed in the Yellow Pages, or write to Westinghouse Electric Corp., Air Conditioning Division, Hyde Park, Boston 36, Mass.

*Installed by Mechanical Heat & Cold, Inc., Detroit, Michigan



Heads, end bells and side plates have not once been removed since installation in 1942 despite a continuous service record totalling 54,000 hours.



Controlled air supplied to each capsulating machine insures the absolute uniformity of product that is required.

YOU CAN BE SURE...IF IT'S

Westinghouse

J-80253

AIR CONDITIONING

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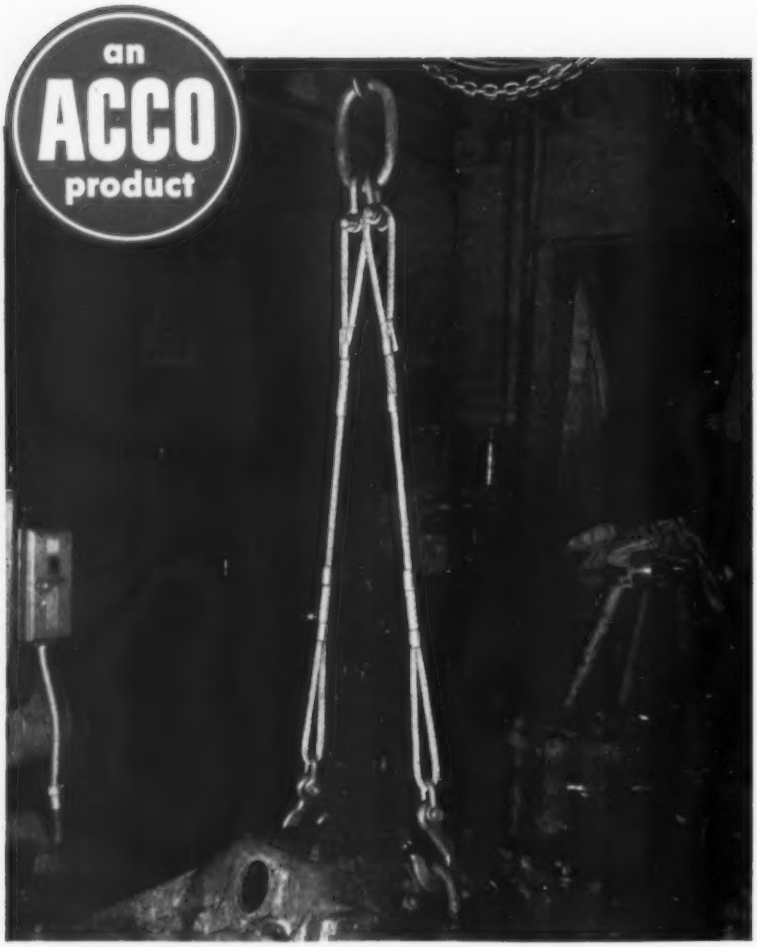


How ACCO REGISTERED Stock Slings Save You Money—with Safety

1 • **You Get ALL the Strength You Pay For**—DUALOC* Endings insure against any loss in the catalog strength of the preformed Green Strand wire rope the sling is made of.

2 • **You Lower Your Sling Maintenance Costs**—If damaged, any part of the sling can be replaced in your own shop with another ACCO *Registered* part of equal strength. No delay. You don't ship the whole sling to have one part repaired.

3 • **ACCO Slings are Stocked by Your Industrial Supply House**—His stock is based on YOUR needs. So, your sling inventory can be held to a minimum since your distributor's stock is as close as your telephone.

4 • **These Slings and Fittings are "ACCO *Registered*"**—This assures you of highest quality and safety throughout.

Write today to our Wilkes-Barre office for name of the ACCO *Registered* Sling distributor nearest you.

*Trade Mark Registered. • Patent No. 2463199

ACCO Registered DUALOC Slings

ACCO
WIRE ROPE SLING DEPARTMENT
AMERICAN CHAIN & CABLE
TRADE MARK
Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For more facts circle 530 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

Ohio plant of the Westinghouse Electric plant replaces the manual operation. It places the starting winding with an assist from the running winding.

After the running winding is in place, it is energized with 12 v d-c, thereby making magnets of the poles in the core. These poles then assist in holding the forms in position for the automatic insertion of the starting winding. *From a release of Westinghouse Electric Corporation, Pittsburgh, Pa.*

Stock Inventory by Wire

THE LARGEST fine paper house in Canada, Kruger Paper Company represents some 40 mills. These supply stock to hundreds of printing firms from coast-to-coast and the Caribbean area.

In common with any other firm, Kruger must maintain inventory by periodically "taking stock." To accomplish this in a warehouse with over 60,000 sq ft of floor space, the firm utilized the services of not only

Chest microphone picks up inventory details spoken by stocktaker. This is recorded on a plastic belt in unit, not shown. Device in the right hand carries flashlight and Dictaphone control

warehouse personnel, but also those of sales and office staffs. In one instance, over a year ago, it required 751 man-hr to take stock.

The system used involved teams made up of two men, one to count the stock and the other to record the type of stock and the quantity of each item on a stock sheet. This system, often referred to as "call-and-write" or sometimes as "writing-up-stock," consumed a tremendous number of man-hr.

an **ACCO** product

When You Need More Headroom...

● You'll find remarkably close headroom in the new trolley-mounted WRIGHT *Speedway* Hoist. From beam to hook is only 12¼" on the Frame 1.

This hoist is compact, ruggedly built, and perfectly balanced. It is designed with features that make it easy to use and give it unusually long life. Servicing is simplified by quick disassembly of parts or sections of the new WRIGHT *Speedway*. Wire rope is rigged to last longer and is easily replaced.

Here is a hoist you will like. It is priced right and will give you long, low-cost service. See your WRIGHT distributor right away or write us for literature on WRIGHT *Speedways* with capacities from ¼ to 10 tons.

WRIGHT
Hoists
Trolleys
Cranes

ACCO

TRADE MARK

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For more facts circle 531 on Reply Card

after 5 years' service this REPUBLIC WATER HOSE comes home in a bag!!

It's a fact! Five years ago a 50-ft. length of Republic Rubber Water Hose became part of a roof-top cooling system at the Kircher Asbestos & Rubber Company, Phoenix, Arizona.

The hose lay immobile across a flat, black-topped roof, channeling waste water from the cooler to a downspout drain. It was exposed to all the elements, summer and winter. Temperatures varied from a shivery 20° to a blistering hot 150° and yet, after five full years of service, the Republic Hose **showed absolutely no visible signs of deterioration!**

So remarkable was its condition that company officials cut off a sample section of the hose, put it in a bag and returned it to us with a letter of commendation. Another example of Republic superiority . . . more proof that Republic Rubber Products are **quality-built** for every type of industrial service, and, whether it's Hose, Belting or Rubber Specialities, it pays to specify the best —**Republic Rubber Products!** Write today for full facts.

Since 1901, Republic Rubber has been the outstanding source for all types of Industrial Rubber Products. Write us today for the name of your local Republic Rubber Distributor, who can save you time and money through expert installation, application and maintenance service.

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

Under the new method, Kruger uses only one electronic Dictaphone inventory machine which has decreased the number of man-hr required for stocktaking from the previous 751 to only 67 . . . and the latter covered a much larger inventory.

The present equipment consists of a transcribing unit for the stocktaker. It is equipped with 200 ft of cable to permit the operator to move around freely.

This cable connects with a chest microphone, strapped to the operator and to a combination pistol-type controller and flashlight by which the stock-taker operates the Dictaphone.

Flashlight attachment facilitates reading labels on packages. The controller also serves as a warning to the stock-taker when the belt upon which the recording being made is nearly finished.

The weight of all the equipment listed, plus a carrying case, is only 34 lb. It allows the stocktaker complete freedom of movement for operating the battery electric fork truck which is used to shift loads fronting on the aisles so that stock in the rear can be accurately counted.

One of the main items in stocktaking is naturally the number of rechecks that come back to the warehouse from the Kardex for recounting. Kruger found that under the new system, rechecks from the warehouse stock taken to the Kardex was cut down more than 50 per cent. *From Exide Topics, published by Exide Batteries of Canada Ltd., Toronto, Canada.*

Unit Deepfreezes Metals

SWISS METAL workers once hauled heat-treated steel to the top of the Alps and left it there to age. The seven years of aging in Alpine weather have now been squeezed into 4 hr of man-made winter by a machine no bigger than the kitchen ice box.

Six years young, the Sub-Zero Products Co. of Cincinnati now receives as many as 50 inquiries a day from all branches of industry seeking information on the firm's one product—the Sub-Zero chilling machine.

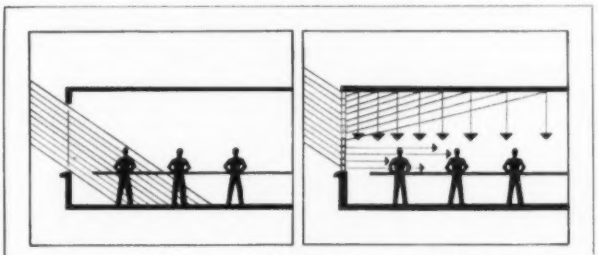
Operating in conjunction with regular heat-treating machines, the chilling machine allows the metallurgist to put a piece of steel through a temperature range that runs from 2200 deg above to 150 deg below zero.

When a piece of steel emerges from 4 hr of seesawing between ex-

Window maintenance problems are virtually ended once Insulux is in—no painting, no rust or rot, no shades, no harmful glare—just plenty of free, natural, comfortable daylight.

Daylight is free . . . use more of it through Daylight Engineering

The problem of daylighting industrial areas can be solved by the selection of the proper Insulux Fenestration System. No longer is it necessary to paint out or shade glass areas in your plant to control glare. Light control through Daylight Engineering with Insulux light-directing glass block makes it possible to use the *entire* glass area for the transmission of light.



Direct sun causes uncomfortable brightness near windows, extreme contrast in other parts of room. Insulux Fenestration directs and spreads part of the daylight to the ceiling—diffuses the balance, keeps brightness at comfortable levels.

New Insulux Glass Blocks Numbers 363 and 365 reduce the necessity for careful orientation of glass areas because they control light so efficiently that they virtually "*turn your building with the sun.*"

Over and above daylight control other advantages in the use of Insulux Glass Block are:

(1) They are permanent; they do not rust or rot.
(2) They have a high insulation value.
(3) They are immediately available.

Daylight is free—Don't abuse it—Use it. Ask for the service of a Daylight Engineer to help you solve your daylighting problems. He'll be glad to give you more information or assist you in adapting Insulux Fenestration to your specific needs. Write: Insulux Glass Block Division, Kimble Glass Company, Dept. PE3, Box 1035, Toledo 1, Ohio.

KIMBLE GLASS COMPANY

Toledo 1, Ohio—*Subsidiary of Owens-Illinois Glass Company*

SLY PIONEERS and LEADERS in INDUSTRIAL DUST CONTROL

Soy Bean Mill. Two large double file Sly Dust Filters handling soy bean meal dust.

SOY BEAN PLANT SAVES $400 PER DAY Through DUST RECOVERY

Because of the meal dust created in processing soy beans, this company* included Sly Dust Filters, as standard equipment five years ago, in its original layout.

The Sly Filters collect 5½ tons of soy bean meal *daily*, at a value of upwards of $400. Not only is the company highly pleased with these savings but also with the resulting cleanliness of its plant. Filter maintenance has been insignificant.

In crushing, shredding, pulverizing, loading, packaging, operations—in various process industries—dust is created. If valuable, the dust can be reclaimed profitably. Even if the dust has no value its collection pays off in cleaner plants, better working conditions and reduced costs.

Expertly designed and built, Sly Dust Filters offer many advantages in greater filtering capacity, easier bag replacement, automatic control, and other features which spell low cost operation.

MAY WE TELL YOU MORE ABOUT SLY FOR YOUR PARTICULAR APPLICATION?

*Name upon request.

THE W. W. SLY MANUFACTURING CO.

4600 TRAIN AVENUE • CLEVELAND 2, OHIO

New York • Chicago • Philadelphia • Syracuse • Detroit • Buffalo Cincinnati • St. Louis • Minneapolis • Birmingham • Los Angeles • Toronto

For more facts circle 534 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

tremes of heat and cold, it has actually been cheated out of many years of awkward growth.

It is now completely stabilized, will maintain its size within microinches. In addition, hardness is increased, magnetic qualities improved and the life span lengthened by as much as 400 per cent.

Basically, the freezing unit is a heavy steel chamber, ranging in size from 4 to 10 cu ft. It is served by two complete refrigeration units. Four inches of Santocel A are used to maintain the cold atmosphere.

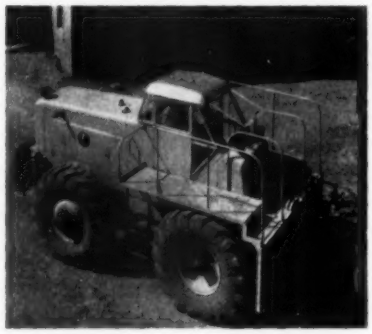
Development work still goes on, but the efficiency and versatility of the standard chilling machine has caused more than a hundred to be installed in the last 15 months, along with daily reports of new applications. In the artificial Arctic the weather looks good. *From Monsanto Magazine, published by Monsanto Chemical Co., St. Louis 4, Mo.*

Small-Time Switch Engine

EQUALLY AND PERHAPS MORE important to many companies than in-plant materials handling is the handling of raw or finished materials in the company's freight yard.

Obviously, none but the largest industries can afford the use of railroad switch engines to move box cars and gondola cars. Extremely high costs per car moved by standard engines are not warranted in ordinary operations.

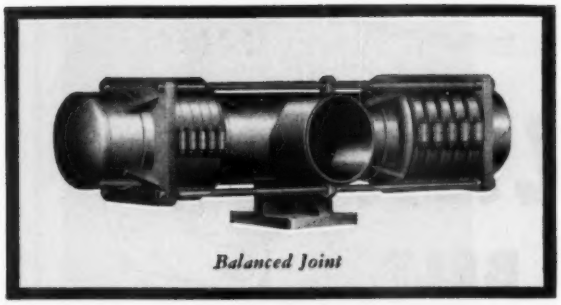
The International Salt Co., Inc., uses a "Payloader" tractor at its Detroit mines as a small locomotive



Tractor switch engine is equipped with catwalk and railings for ease and safety

to move empty railroad cars from a gravity storage yard to loading stations under the mill bins.

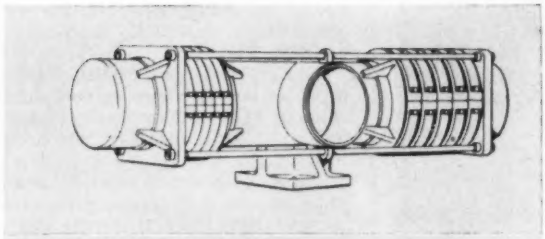
This type of tractor, replacing a crawler tractor formerly used, can safely pull two cars at a time. At times, as many as five gondola cars



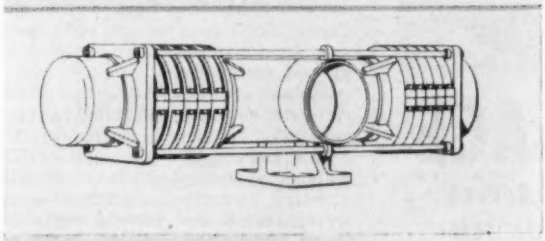
Balanced Joint

FOR A BALANCED SELECTION

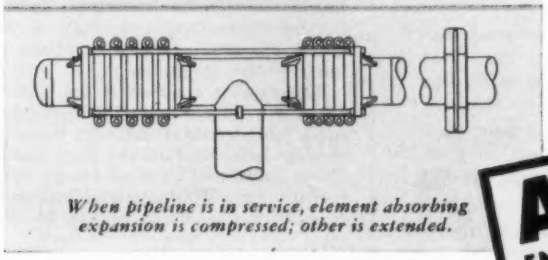
Look First at ADSCO *Corruflex* EXPANSION JOINTS



Balanced Joint Before Absorbing Expansion.



Balanced Joint After Absorbing Expansion.



When pipeline is in service, element absorbing expansion is compressed; other is extended.

• Buying an expansion joint from ADSCO is like shopping in a super-market. Everything you need is under one roof. Offering the world's most complete line of both slip and packless expansion joints, ADSCO is the only manufacturer able to supply the right joint for every purpose. ADSCO's complete line is backed up by an engineering service which since 1877 has found exact solutions to customers' special problems.

An example of ADSCO's versatility is the Corruflex Balanced Joint illustrated here. This packless expansion joint is designed to accommodate axial motion and eliminate end thrust at pipe intersections. The rods tie the joint ends together, thereby transmitting the end thrust to a distant point where adequate anchorage is available. The joint thus requires only the equivalent of an intermediate or stabilizing anchor.

So when you're shopping for expansion joints, come to ADSCO first. You won't have to look elsewhere . . . Call your ADSCO representative or write for Bulletin 35-51A.

ADSCO ENGINEERED PRODUCTS

EXPANSION JOINTS • HEAT EXCHANGERS • TRAPS • STRAINERS • SEPARATORS • METERS

AMERICAN DISTRICT STEAM COMPANY, INC.

NORTH TONAWANDA, NEW YORK

Since 1877

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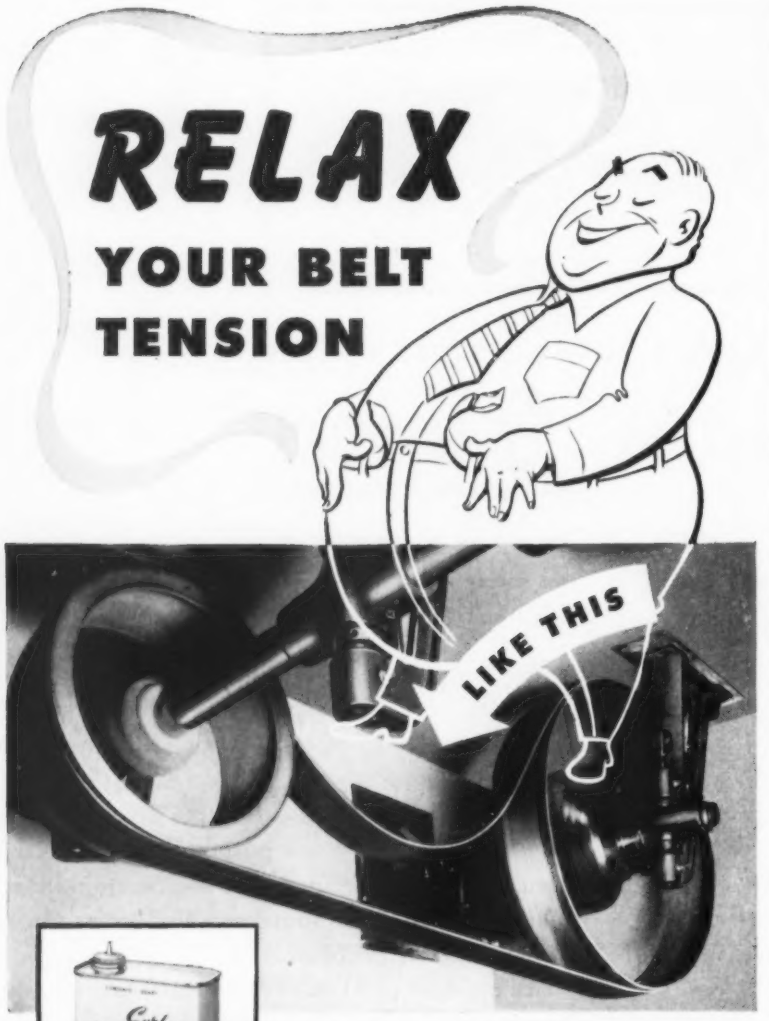

CLING-SURFACE

MAKES BELTS
1. WORK BETTER
2. LAST LONGER
3. SAVE POWER

Stop running your transmission belts *tight!* Belts run under high tension, stretch and constantly require "take-ups" which cause costly down time. They increase the friction load, waste up to 50% of your power and place needless strain on bearings and shafting.

By merely applying Cling-Surface to your belts, you greatly increase their "grip" and by relaxing the tension, you actually *increase* the surface areas the belts "cling" to. This "slack belt" operation practically eliminates belt repairs, makes belts, bearings and shafting last longer and delivers MORE POWER to your machines.

The ONLY belt preservative in existence that has passed U.S. Government requirements, Cling-Surface is also the ONLY brand that DARES to recommend this economical, trouble-free, "slack belt" way to end belt worries. A trial will convince you! Sold on MONEY BACK GUARANTEE since 1896. Ask your mill supply man or,

SEND FOR THIS FREE BOOK
"THE TRUTH ABOUT ALL BELT DRESSINGS"

CLING-SURFACE CO. 1046 NIAGARA STREET BUFFALO 13, NEW YORK
CLING-SURFACE CO. OF CANADA, LIMITED, TORONTO, ONTARIO

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PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

are moved by the machine at one effort.

The operator simply drives up to the selected car, spots his coupler in position, latches tractor and car together, and is on his way. Of prime importance has been the decrease in maintenance of the siding ballast, since the rubber-tired tractor has been operating.

Engaging the prime mover to the cars at the coupler, where cars are intended to be engaged, eliminates all danger of damage to the car—and maximum safety precaution for the crew is achieved. *From Industrial Handling, published by the Frank G. Hough Co., Libertyville, Illinois.*

Motorized Valve Saves Steam

A PROBLEM involving slurry removal presented itself to the Imperial Paper and Color Corporation of Glens Falls, N. Y.

Set into the floor of the plant is a pit, or sump, where spilled slurry collects. This liquor has an abundance of abrasive solids suspended in it.

These solids would wear out pump impellers in a hurry if these were used to pump the slurry out. Therefore, an ejector using steam seemed to be the answer. It worked well, except that the float valve that turned the steam on and off according to variations in liquid level leaked constantly.

Robert A. Starbuck, the maintenance engineer, installed a two-position motorized valve in the steam line supplying the ejector. The valve is automatically controlled through a mercury switch mounted in a pivoted box, that is connected to an arm linked to a float in the pit.

Now, when the float comes up with liquid level, the mercury switch makes contact and energizes the valve. The valve opens and steam feeds to the ejector.

The ejector draws out the liquor, and the abrasive material suspended in it, and shoots it through the discharge line to the recovery tank. *From Industrial Control News, published by Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa.*

Tips on Battery Additives

UNDER THIS TITLE in the Plant Engineers' Digest section, page 26, January, 1952 issue, appeared a summary of tests reported by the Bureau of Standards indicating that battery additives had no effect on storage battery performance and life.

The results of these tests were

contested by Pioneers, Inc., of Oakland, Calif., manufacturers of Battery AD-X2. As a result, the Senate Small Business Committee arranged for a series of tests to be made in the laboratories of the Massachusetts Institute of Technology.

A report of these tests, with a review and discussion by Dr. K. J. Laidler of the Catholic University of America, was recently released by the Committee as Report SSB No. 109. Copies may be obtained without cost from the Senate Select Committee on Small Business, 131 Indiana Avenue, N.W., Washington, D. C.

In his summary, Dr. Laidler states that the tests show that Battery AD-X2 will:

a. Reduce harmful effects of sulfation and extend the life expectancy of mechanically sound lead storage batteries.

b. Encourage the redeposition of shed materials.

c. Decrease loss of water.

d. Increase speed of charging, and normally increase the capacity of mechanically sound sulfated batteries.

e. Protect stored batteries containing acid for longer periods against destruction by sulfation.

Fire Protection — Special Design

IT HAS LONG been recognized by the Texas Division of the Dow Chemical Co. that the most positive means of safely storing and handling flammable liquids from a fire protection standpoint is through the medium of fine waterspray protection. They have also proved that ingeniously designed liquid storage tanks can be safely protected from the hazards of fire by equally ingeniously designed waterspray installations.

A storage tank with a capacity of 2500 barrels of liquefied methyl chloride was required. Because of space limitations, it was built as a multi-spherical vessel, the first of its kind. It consisted of 14 part-spheres welded together. This unusual construction affords a high degree of structural stability with maximum storage space, yet consumes a minimum of ground area.

To protect all areas of this uniquely designed vessel with automatic waterspray protection, the spray heads had to be arranged to protect adequately all surfaces of the vessel, including the many interstices formed by the part-spheres. The rate-of-rise heat detecting units had to be strategically located about the vessel in order to immediately detect temperature rises from fire. As the result of design study and consultation, a waterspray system, completely encircling the vessel surfaces, was installed. It provides fire protection from every "angle." *From the Sentinel, published by the Factory Insurance Association, Hartford, Connecticut.*

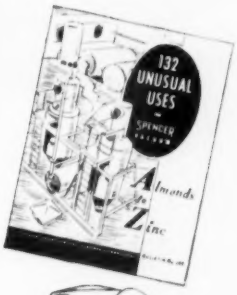
BENCH WORK with SPENCER HARTFORD VACUUM

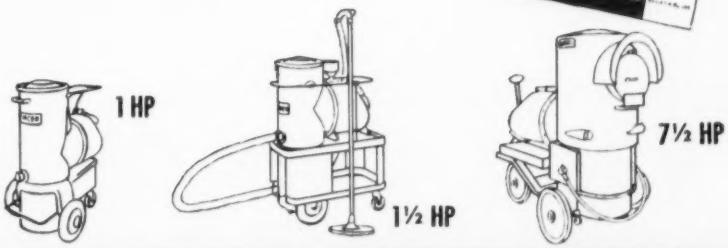
Bench work on delicate airplane instruments was speeded up by providing each worker with a special Spencer Vacuum tool with a hand valve as shown above. It is similar to the older method of providing a compressed air line for every bench except that all particles including the finest dust are collected in a container instead of being blown all over the room.

There are more than a hundred special uses for Spencer Vacuum in industrial plants. It will reclaim metals, pick up water, handle hot materials and even convey loose materials such as rice, chemical powders and foundry sand, by the ton.

Look over the 132 unusual uses for this new industrial tool, and remember that your plant housekeeping will be done better and faster, every night, with the same equipment.

Ask for Bulletin No. 144





THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

466-B

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We have just one axe

CARBO TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N. Y.

to grind . . . YOURS!

You get UNBIASED COUNSEL based on all abrasive methods

Your business, in mass production of parts or finished assemblies, is the problem of generating close tolerance sizes, of producing high surface finishes, of removing stock. The business of CARBORUNDUM is the exclusive ability to recommend and furnish you the specific type of abrasive product which will give you highest quality at lowest cost, on every operation you perform.

Take snagging, for instance. With abrasives there are at least 9 different ways to remove stock at high rates. That means the odds are 9 to 1 there's a better, lower cost way than the one you're using now. How can you be *sure?* By asking CARBORUNDUM . . . for CARBORUNDUM alone has a complete, branded line of grinding wheels *and* abrasive belts *and* tumbling and polishing grains . . . and only CARBORUNDUM can recommend without bias, on the sole basis of what's best for you.

Or suppose you're manufacturing shears . . . you must remove scale with tumbling nuggets — finish with abrasive belts — sharpen with grinding wheels — polish with abrasive grain. CARBORUNDUM alone can give you *one-source control* of abrasive quality, on every type of abrasive you use . . . quality that's constant, identical, dependable — thus economical.

Several ways to do one operation? Call in CARBORUNDUM. Several processes on one part? Call in CARBORUNDUM. Either way, you win.

Call your CARBORUNDUM *Salesman or Distributor* today!

He's your best bet for complete stocks, prompt delivery . . . and best of all, experienced counsel on *every* new development in the *entire* field of abrasives. He's in the yellow pages under "Abrasives" or "Grinding Wheels." Phone him today — it's to your profit!

Ready now — your free copy of the new big COATED ABRASIVE SELECTOR catalog . . . containing detailed recommendations for both machine and hand sanding operations on tough and soft metals, glass, plastic, wood. Phone for it today.

RUNDUM

MARK

. . . the ONLY source for EVERY abrasive product you need

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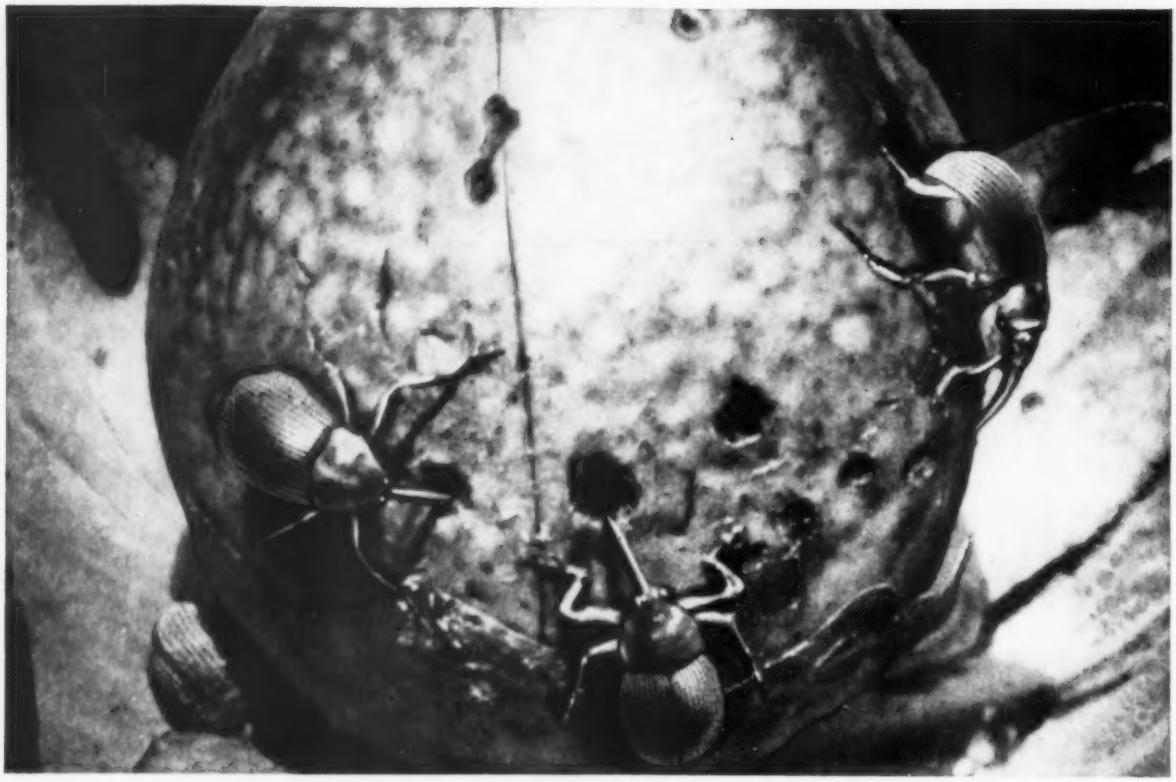

Foiling the beetle with the half-billion bite!

$500,000,000—that's what those little beetles on the cotton plant above cost America in 1950. The boll weevil adds a whopping $10.00 a year to the price every one of us pays for cotton goods. Producing four to five generations a season, the female boll weevil first destroys the flower buds of the cotton plant by laying her eggs in them; later generations deposit their eggs in the cotton bolls, where the greedy grubs raise havoc with the silky cotton fibers. The boll weevil is probably the most destructive of all insect pests, and has forced large agricultural areas to abandon the growing of cotton altogether.

Today our most effective weapon against this pest is the new insecticide BHC (benzene hexachloride). So great is the demand for it that the production of BHC increased 300% last year and now equals or exceeds that of any other insecticide. BHC is produced by the controlled chlorination of benzene by means of a catalyst. Its commercial production is made more difficult by the corrosive qualities of the basic ingredients and the temperatures at which the catalyst operates. To handle these corrosives effectively, processors of this insecticide use many ALOYCO corrosion-resistant valves in the plants where they make BHC. Like the makers of benzene hexachloride, manufacturers of other insecticides such as DDT, Toxaphene, Rotenone, arsenates, and fluorides also depend upon ALOYCO valves for the protection of their products.

ALOYCO valves are supplied in stainless steel and other corrosion-resistant alloys by the Alloy Steel Products Company, Inc., the world's largest specialists in valves for corrosive service. Such concentration has developed a practical knowledge of the chemistry of corrosion, and produced the metallurgical and mechanical know-how to combat it. That's why ALOYCO corrosion-resistant valves are used by many leading firms in the chemical field . . . to handle anything from acetic acid to zirconium tetrachloride.

ALOYCO valves go hand-in-hand with chemical progress.

If corrosives play a part in your business it would pay you to bring your problems of corrosion, contamination, discoloration, or temperature extremes to the *Aloyco Corrosion Engineering Service*. Our engineers and metallurgists will be glad to pre-test various alloys under actual line conditions; our long and diversified experience in this field is available to assist you in selecting the correct valves and alloys to meet your particular requirements. Write us about your own corrosive problems. 3.7

Longer Lasting
ALOYCO VALVES
1st in Corrosive Service

ALLOY STEEL PRODUCTS CO., INC.
1308 West Elizabeth Avenue, Linden, N. J.
Plants: Linden, N. J.; Bloomfield, N. J.; Elizabeth, N. J.

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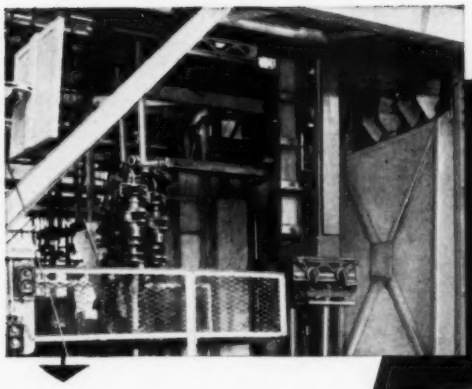
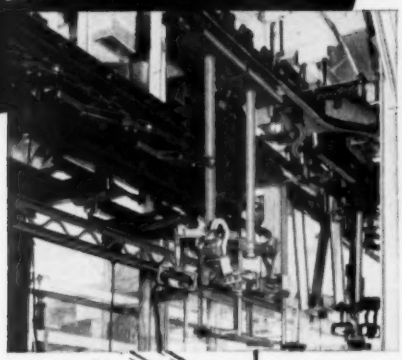
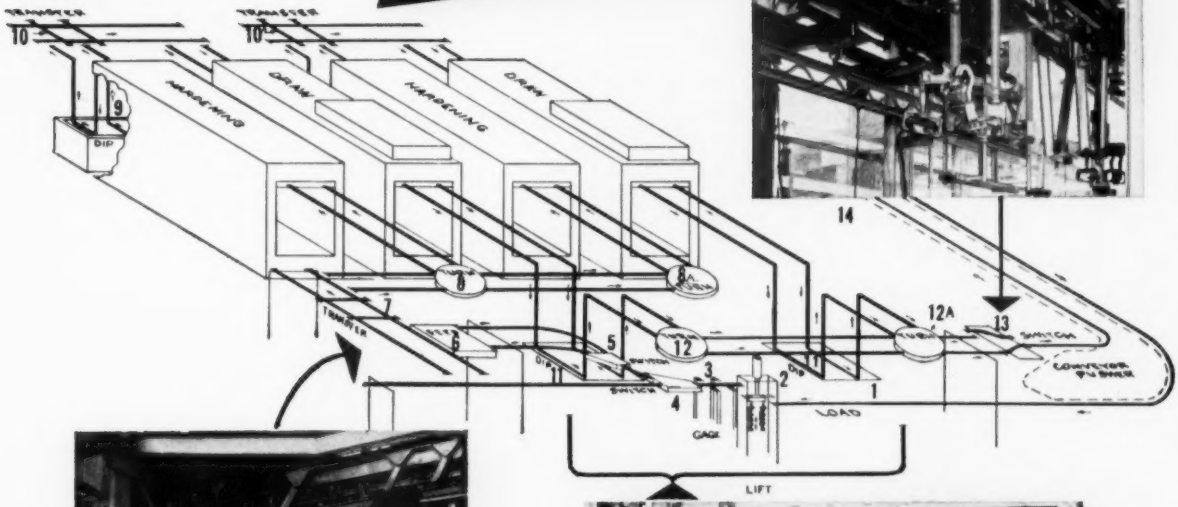
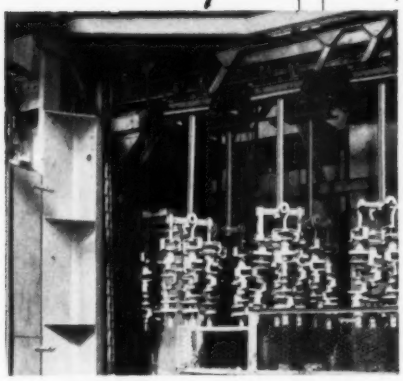
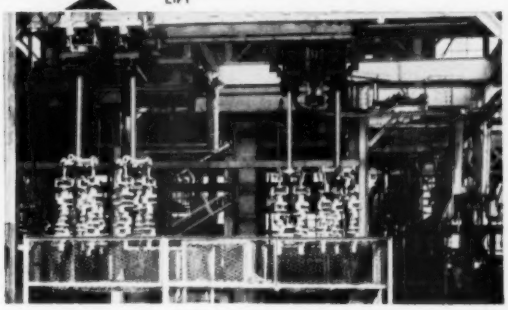


"Automation" by AMERICAN MONORAIL









KEY TO DIAGRAM

Station No. 1, Empty Carriers are loaded with connecting rod crankshafts and raised on Lift No. 2 to working level of furnaces. Carriers pass through gaging device No. 3 to insure concentric loading. Loaded carriers are pushed through Switch No. 4 and Switch No. 5 which are controlled manually from the floor. Carriers are deflected right or left into Feed No. 6. From this point on the system is fully automatic.

Carriers work through Automatic Feed No. 6 onto Transfer Crane No. 7 which travels and lines up with Spur Tracks going to Turntable No. 8. Carriers then move onto the turntable and rotate 90 degrees for feed through the Hardening Furnace.

Upon emerging from this furnace they are dipped into Quench Tank No. 9 and then travel on Transfer Crane No. 10 which carries racks for return travel through the Drawing Furnace. Crankshafts then travel through this furnace and when finished are cooled in Tank No. 11 and fed through Turntable No. 12.

After rotation of 90 degrees the carriers pass through Shuttle Switch No. 13 for single line movement and pick-up by Pusher Conveyor No. 14 for transfer to unloading station.

From hand operated to fully automatic handling systems, American MonoRail will save you money. Regardless of how simple or how complicated your handling problems may appear to be, American MonoRail can engineer a system to fit your needs. Experienced engineers will gladly consult with you on any handling problems. Write for the new "Case Study File" showing many varied applications.

THE AMERICAN MONORAIL COMPANY

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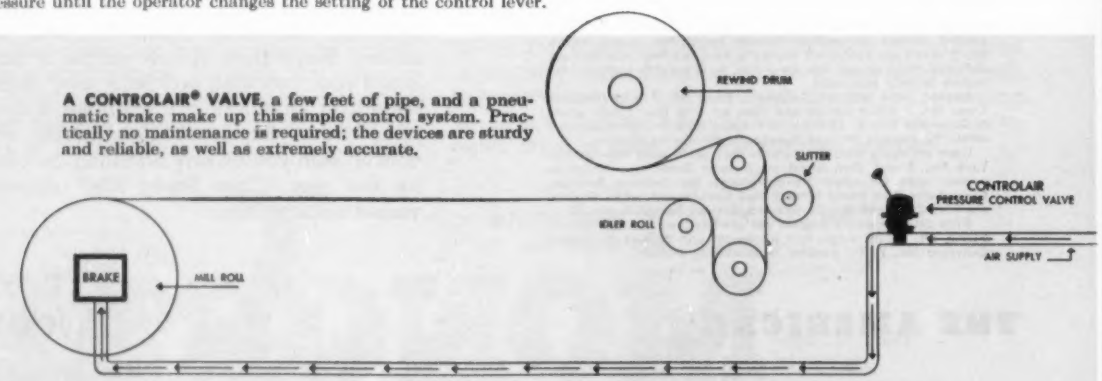
For more facts circle 540 on Reply Card

Let AIR do the work

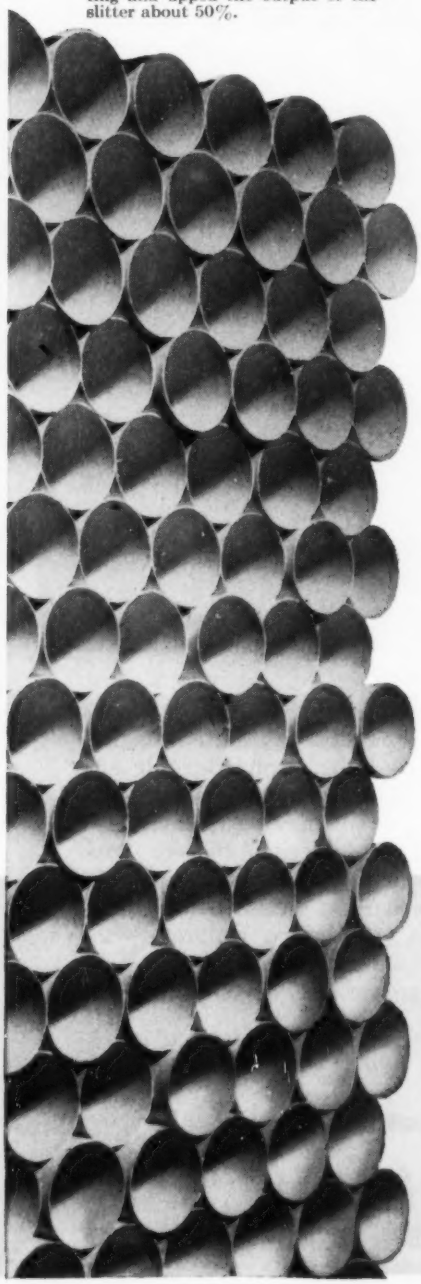
COMPRESSED AIR is used to control paper tension in this Camachine paper slitter installed at Miro Container Co., Inc. A Westinghouse Controlair® pneumatic valve regulates the air pressure. Once set, this valve automatically maintains the desired air pressure until the operator changes the setting of the control lever.

A CONTROLAIR® VALVE, a few feet of pipe, and a pneumatic brake make up this simple control system. Practically no maintenance is required; the devices are sturdy and reliable, as well as extremely accurate.



Westinghouse pneumatic control boosts output of paper slitter 50%!

HERE'S THE PRODUCT—paper food containers that are wound from paper that is slit on the Camachine. Precise penumatic control materially reduced torn paper during slitting and upped the output of the slitter about 50%.



"*Don't take it away!* This Controlair® valve really works smooth!" That's what the man said who runs the Camachine paper slitter at the Brooklyn plant of Miro Container Co., Inc. The new Westinghouse air-pressure control valve was paying off — in more production, lower costs, and smoother operation.

Cameron Machine Co. of Brooklyn, N. Y., makes the Camachine. They control paper tension by regulating the speed of the input paper roll with a pneumatic braking system. The air pressure supplied to the brake diaphragm must be controlled precisely to prevent backlash and interleaving of the paper; but the valve they had been using was inaccurate. Paper was tearing and interleaving, wasting paper and delaying production.

The Westinghouse Controlair® valve has everything Cameron engineers had been looking for. It's rugged and simple. It operates easily. And it's *accurate* . . . automatically maintains a selected air pressure against line leakage.

Since this valve was installed at Miro Container Co., paper loss has dropped about 10%. With fewer production delays, about 50% more paper can be slit per day.

PUT AIR TO WORK ON *YOUR* EQUIPMENT

We can give you expert advice on the most profitable way to use air. And we can offer you a complete line of proven pneumatic devices—everything from air compressors to valves and actuators and including a complete *new* line of cushioned pneumatic cylinders, all made by Westinghouse Air Brake Co. Write for information.

Westinghouse Air Brake COMPANY

INDUSTRIAL PRODUCTS DIVISION WILMERDING, PENNA.

Factory Branch: Emeryville, Calif.
In Canada: Canadian Westinghouse Co. Ltd., Hamilton, Ontario

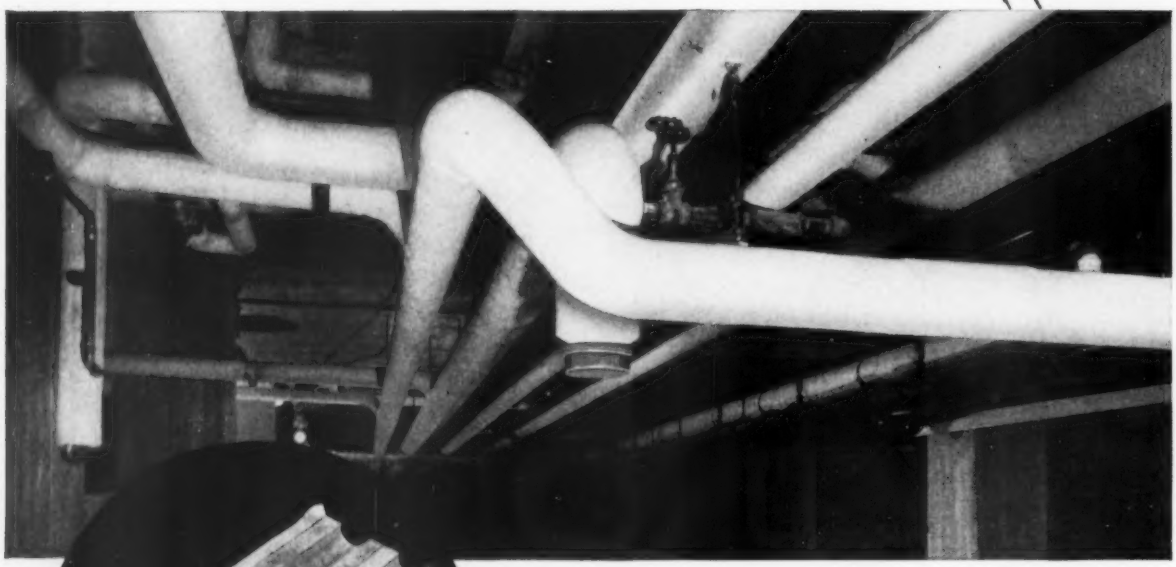
Here's what you can do with the CONTROLAIR® pneumatic valve

Use this Westinghouse Controlair® valve wherever you want a variable, controlled air pressure below 100 psi. It has been used to operate pneumatic clutches, brakes, cylinders, and actuators on diesel engines, hoists, wire-drawing rolls, chemical flow valves, clamping devices, and other equipment. You can operate this valve by hand, foot, or cam.

Other pneumatic devices made by Westinghouse Air Brake Co. include: flow, relay, and check valves, chokes, cocks, single- and double-acting cylinders, actuators, line filters, and air compressors. You can get a complete pneumatic system from Westinghouse Air Brake Co.

For more facts circle 541 on Reply Card

take a long look at the insulation you never have to look after.... Amocel



That's right! Unarco Amocel is as maintenance-free as an insulation can be—light, strong, durable ,efficient. It's unharmed by moisture, steam, fumes; withstands impact and vibration; may be removed and reused repeatedly without damage or efficiency-loss.

Amocel, a Unarco exclusive, brings to commercial insulation applications many of the excellent features already made famous by Unarco Unibestos—the higher-temperature stand-out. You'll like its easy installation, its clean appearance, its year-after-year effectiveness.

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OPERATION & PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

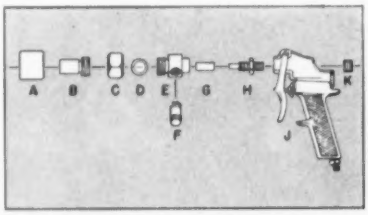
Damaged Spray Guns Modified For Use in Abrasive Blasting

SPRAY GUNS, damaged and no longer suitable for spraying paint, can be modified for use in abrasive blasting.

The damaged part of the gun should be cut off, and the thread and assembly parts removed. Installation of the parts shown in the drawing will provide a complete unit. The gun parts required are: A. Rubber nozzle protector; B. Carboloy nozzle; C. Retainer nut; D. Rubber washer; E. Siphon tee; F. Siphon nipple; G. Rubber jet protector; H. Air jet; J. Gun body; K. Gun body plug.

The pipe tee E is ⅜ in., and the reducer H reduces from ⅜ to ¼ in.

The use of this type of gun instead of heavy, cumbersome and fatiguing equipment will increase production, save air by closer control, and improve the quality of the work produced. The gun is light, flexible, and easy to handle.



Exploded view of gun shows parts required for modification of spray gun

How to Make Copper Tube Solder Joints

Copper water tube and fittings designed to provide proper tolerances may be easily joined using soft solders by following five simple rules, as outlined by John S. Coe, Manager of Products, Chase Brass & Copper Co. Pretinning is unnecessary because capillary action will draw molten solder between the tube end and the inner surfaces of the fitting to form perfect, watertight joints. Here are the five rules:

1. Polish outer tube ends and inner surfaces of fittings.
2. Apply a suitable flux to these areas.
3. Apply heat and solder.
4. Remove residual solder and flux.
5. Let joint cool.

Tube ends should be cut square with a fine-tooth hacksaw or by means of blade cutters. Mitre tools are available for cutting copper water tube sizes up to 2 in. The chamfering of inside and outside tube edges will make joining of tube and fitting easier in the larger sizes.

Steel wool or sand cloth may be used to polish the outer surfaces of tube ends and the inner surfaces of fittings before flux is spread on these areas.

The purpose of the flux is to assure chemically clean surfaces and to prevent oxidation when heat and solder are applied. Flux should be mildly corrosive for cleaning metal surfaces but this action should cease during the soldering process. Because of this, a flux that is recommended for use without precleaning the copper surfaces should be avoided because it may continue to be corrosive after soldering is completed. A flux best suited for copper consists of zinc and ammonium chlorides prepared with petrolatum in convenient paste form.

Soft solder is adequate for joints in water lines where temperatures do not exceed 250 F and there are no excessive pressures or stresses. Types of solders that may be used include 50/50 tin-lead, 95/5 tin-antimony or other tin-lead alloys.

Heat may be applied to the joint by means of a gasoline blow torch or an air-gas torch. Wire solder should be applied as the flame is moved away from the joint. At the right temperature solder will melt and can be flowed into the joint until it is filled. Care should be taken to avoid overheating the joint and consequent burning of the flux, since solder will not enter an overheated joint and its surfaces will have to be recleaned.

The soldering of fittings that are more than 2 in. in diameter may be done by heating with one or more torches but greater care is required to prevent spot overheating, par-

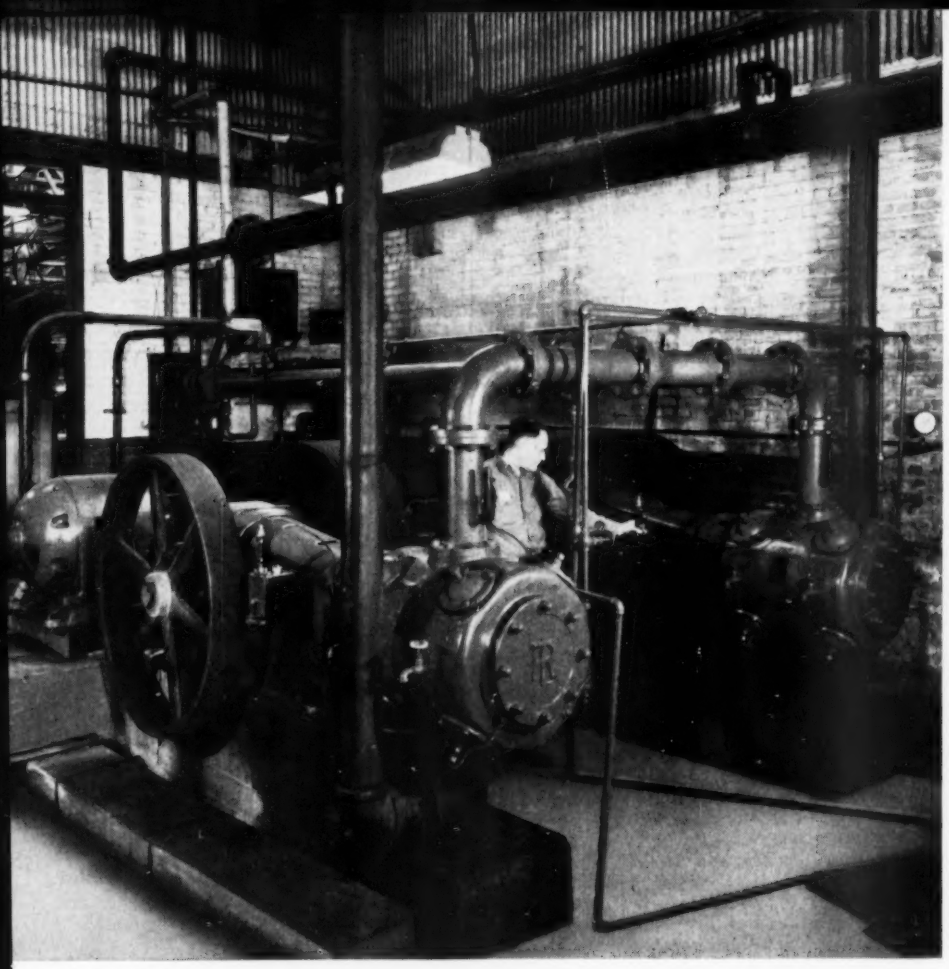
Merry-Go-Round Assembly Line Turns Out Coolers

ASSEMBLY of small fountain-type water coolers at Uniflow Mfg., Erie, Pa., has been put on a semi-mass production basis, through the use of a hexagonal merry-go-round. About 10 ft. in diameter, the merry-go-round is of heavy wood construction and rides on industrial casters for circular motion.

On the revolving unit are eight "work stations," or individual square platforms that, in turn, ride on casters so they can be rotated on a center pivot. The partially assembled cooler bodies are placed on the platforms and several men perform such jobs as adding fittings, panels or insulation as the merry-go-round is manually rotated.

As a materials handling aid, the insulation batting is stored in a sheet metal hopper over the merry-go-round, in position for quicker handling.

Water coolers, in several stages of assembly, ride on rotating work platforms



Compressors give carbon the air

• When carbon formed on the valves of these air compressors and the oil in the crankcases had to be changed frequently, operators of this Midwest plant called in a Standard Oil lubrication specialist. He recommended STANOIL Industrial Oil, a multi-purpose oil having a low carbon-forming tendency and containing effective oxidation and corrosion inhibitors. With STANOIL, the compressors gave the air to carbon troubles and have breezed through four years of hard operation without difficulty. Over the oil previously used, STANOIL has given four times longer service in the crankcases. These results . . . similar to the results you may expect . . . have led to the use of STANOIL in other equipment in this plant.

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You'll find the means to significant savings in this booklet. It describes the important qualities of STANOIL Industrial Oil and the resultant benefits which have made this multi-purpose oil the choice of midwest manufacturers for a host of important lubricating jobs. Discover how STANOIL will give you superior protection through its unique combination of six outstanding characteristics, including high stability and effective rust prevention. Find how STANOIL can simplify stock, storage, and inventory in your plant by replacing special-purpose oils in hydraulic systems, speed reducers, air compressors, machine tools, electric motors, auxiliary turbines, and a wide variety of circulating, bath, and bearing systems. Ask the Standard Oil lubrication specialist from your nearby Standard Oil office for this booklet, or write: Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago.

STANDARD OIL COMPANY STANDARD *(Indiana)*

OPERATION & PRODUCTION

(O and P begins on page 56)

ticularly if more than one heat source is applied. If the flame is moved uniformly over the entire area of the fitting until a point just below the melting point of the solder is reached, large fittings can be conveniently soldered by re-application of heat to limited areas.

By applying the flame over an arc of approximately 2 or 3 in., wire solder can be tested for temperature and then flowed into the joint to form a soldered section. By repeating this step-process, overlapping sections can be made until the entire joint has been filled with solder.

Surplus solder and flux may be removed with a rag or brush, and the joint should be allowed to cool.

When joints exceed 4 in. in diameter, heat is rapidly dissipated so that best results may be had through the use of an oxy-acetylene torch with a medium sized tip. For smaller sizes of copper water tube, gasoline, butane, propane or air-acetylene torches, or "thermo grip" electrical units may be used.

Soft solders are usually adequate for most tube and fitting installations, but hard solders are recommended for use where unusually high temperatures, pressures or stresses are found.

Hard solders are those that have melting points above 600 F. Many of these have melting points of more than 1100 F and, depending on their composition, are identified as silver solders or low temperature brazing alloys. High silver content solders provide desirable properties including flow, joint penetration and high strength for soldering copper water tube and fittings but they are relatively expensive. Alloys that meet the requirements but are less expensive are largely proprietary products.

These alloys may be used as solders without flux, provided that tube and fitting surfaces are clean. If flux is used, they will "wet" tube and fitting surfaces and assure better flow and penetration of the joint. Although there are a number of excellent prepared fluxes available, a satisfactory flux consists of a mixture of powdered borax and alcohol or water that forms a thin milky solution.

Hard solders do not penetrate the full depth of joints as readily as soft solders but because of their physical strength nominal penetration of $\frac{3}{8}$ in. or so is usually adequate.

Blow torches and air-gas torches are suitable for hard-solder joints up to 1 in. in diameter but oxy-acetylene flames are recommended for larger sizes. Low flame pressures are recommended to prevent wasteful spreading of the solder. High-temperature oxy-acetylene flames should be kept moving a slight distance from the joint to prevent melting while hard solder wire is applied.

Truck with Collapsing Ram Carries Hot Wire Coils

A COLLAPSIBLE ram assembly, extendable to 107½ in., replaces the standard fork assembly on two 4000-lb capacity trucks transferring coils of wire from production to storage areas. The assembly consists of a 3-7/16 in. diameter sliding member, inside a 5-in. diameter main member, 71¼ in. long.

Unit loads of wire, in coils, travel through baking ovens on a conveyor belt. The lift trucks are used to pick the coils of wire off the belt for transfer to storage.

The operator of the truck hooks the ram end over a spring-loaded cable strung along the conveyor. As he backs the truck away, the ram is extended to its full length. Spring loading of the cable prevents any sudden over-stressing when the ram reaches its full length.

The fully-extended ram is thrust through the coils of wire on the conveyor. Raising the carriage assembly, the ram is lifted and wire coils are raised clear of the conveyor.

The operator butts the loaded ram into a wood-lined steel column, thus collapsing the ram and compressing the unit-load of wire coils. This not only reduces the length of the ram, making truck movement easier, but also reduces the cantilever loading on the fork truck.

Ram extended by hooking over cable

Photo: Mercury Manufacturing Co.

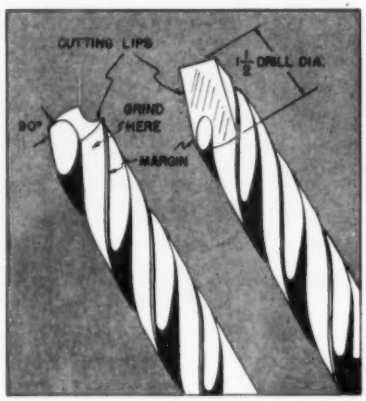
Coil-loaded ram butted against column

Squared Drill Point Cuts Slate

Contributed by H. Nye Josleyn

SPECIALLY GROUND high speed drills can be used to bore accurate holes in slate without loss of time or energy. Most drills, sharpened and used in the conventional manner burn up or break when drilling holes in electric panels, tables, or restroom walls constructed of slate.

In grinding the drill to cut slate, first grind the points square with the shank, removing the old cutting lips and clearances. The ultimate object is to make a chisel-like point extending in a straight line from margin to margin. Grind where the clearance would be located on a standard sharpened drill, keeping the action at right angles to the line across the margins. Extend



Drill point is ground at right angles to shank, with taper to chisel-like edge

the taper of the chisel up the shank to a distance about 1½ times the diameter of the drill. The cutting edges are left about 1/64 in. thick, as opposed to the sharp edge of a true chisel or knife.

This special tool is best used in a hand operated breast drill, turning the drill at not over 100 revolutions per minute. When drilling, use just enough pressure to obtain a good dust. Slow, deliberate action will reduce the tendency to burn the drill point. No lubrication is needed.

Mobile Drip Pans

HYDRAULICALLY OPERATED lifts are used by maintenance men at CBS Television City, Los Angeles, to permit them to work on ceiling-high scenery. Occasionally, the hoist cylinders leak, and the fluid drops on the floor.

To prevent the fluid from reaching the floor, the bottoms of the cylinders were equipped with the sim-

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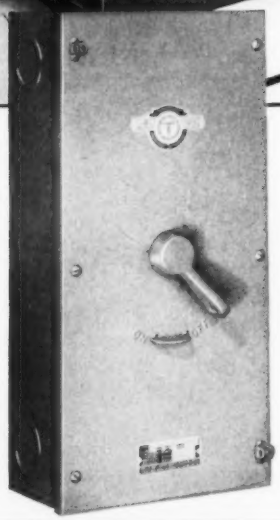
Superior design and construction features enabled Trumbull to develop circuit breakers that withstand the moisture, high-shock, and vibration of shipboard service required by the U. S. Navy. These same basic features enable your Trumbull Distributor to meet your *specific* needs from Trumbull's *complete* line.

Trumbull Circuit Breakers for load centers, panelboards, switchboards, for industrial, commercial and residential applications, provide greater safety to operators, better circuit protection against both shorts and sustained overloads. They pay off in convenience, permanence and fast restoration of service.

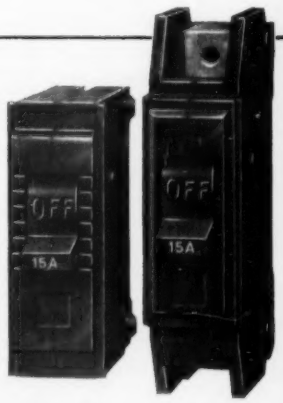
Available in ratings from 10 to 600 amperes and voltages up to 600 volt AC, 250 volt DC, either open type or with surface or flush-mounted enclosures, of semi-dust-tight, water- and dust-tight design. Accessories available for conversion to non-automatic, remote tripping, bell alarm and other special requirements.

Trumbull Circuit Breakers and breaker-equipped load centers, panelboards and switchboards, plus the advice of qualified Trumbull sales engineers, are available through leading Distributors everywhere. Write direct for literature or technical information.

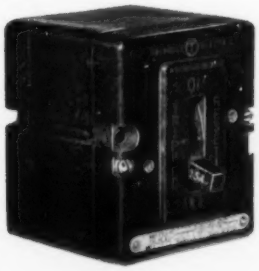


Trumbull AT enclosed circuit breakers feature "trigger" trip, automatic tripping, silver-alloy contacts, individual calibration. 2- and 3-pole construction, from 15 to 600 amperes, 125 to 600 volt AC or 125 to 250 volt DC. Single pole available in 50-ampere frame size breakers, 125 volt AC or DC.

Trumbull TQL (plug-in) and TQ Circuit Breakers feature *both* thermal and magnetic protection, "trigger-type" quick-make and break, trip-free operation, trip-indicating handle, silver-plated contacts, arc-quenching chamber. Individually calibrated and sealed in compact, dead front phenolic cases. Ratings: 10 to 50 amperes, 120 volt AC, single pole.



TYPE TQL TYPE TQ



Trumbull K-173 Marine Hi-Shock Circuit Breakers, 3-pole, 125 volt AC or DC, 50 ampere frame size. Suitable for protection of lighting mains, feeder circuits, single load circuits supplying motors, radar, sonar, etc.

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DEPARTMENT OF GENERAL ELECTRIC COMPANY
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PACKAGED V-BELT FAN UNITS

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NEW! CLARAGE DEVELOPMENT

Clarage Ready Units are a notable advance in "packaged" fan units — highly efficient, compact, quiet in operation. And, like all other Clarage equipment, you can RELY on them for dependable, economical service.

MOTOR DRIVEN ASSEMBLIES—NO EXPENSIVE FOUNDATIONS REQUIRED

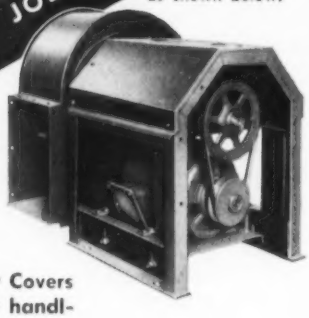
Clarage V-belt Ready Units come in 18 sizes—capacities to 12,000 c.f.m. . . . ECONOMY ANSWER to both INDOOR and OUTDOOR industrial air handling requirements.

Use Ready Units and save the expense of separate motor foundations. Use Ready Units and eliminate alignment problems. Use Ready Units for installations at lowest cost consistent with quality fan equipment.

Ready Units with or without Outdoor Covers shipped immediately. Special units for handling corrosive gases, etc., take longer.

INDOOR JOBS

Standard Ready Units (except three largest sizes) afford protection to fan bearings, motor and drive as shown below.



WRITE FOR READY UNIT CATALOG 515 — a twenty-eight page book, giving descriptive details, capacities and dimensions on the most modern "packaged" fan units available today. No obligation — address, CLARAGE FAN COMPANY, Kalamazoo, Michigan.

OUTDOOR JOBS

Cut below shows Ready Unit equipped with (easily removable) Outdoor Covers shielding all working parts from rain and snow.

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New Manual shows how to properly install and service Clarage fans, blowers and air conditioning units . . . valuable information adaptable to almost any type of fan job. Sent without charge to factory executives, engineers and maintenance officials.

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OPERATION & PRODUCTION

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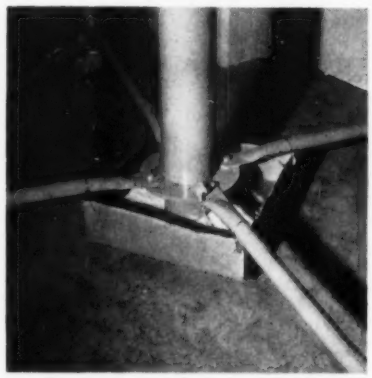


Box containing sand is wired beneath end of hydraulic cylinder to catch oil

plest of catch basins—nothing more than a sand-filled corrugated box, wired to the lift leg cross braces.

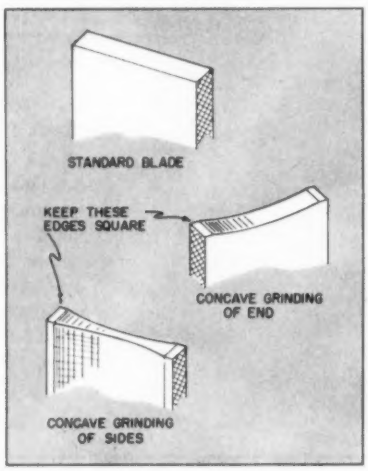
Now, hydraulic fluid is absorbed by the sand, rather than dripping on the floor and making it slippery.

Sharpened Screwdriver Blade

Contributed by H. Nye Josleyn

SPECIAL SHARPENING of a standard screwdriver blade provides a tool that will easily remove round or flat head screws having damaged heads and slots.

The blade of the screwdriver is ground slightly concave on the end, and on both sides. While the grinding does not need to be critically



Two-stage grinding of screwdriver blade tip for producing special removal tool

accurate, the clearances must be definite and the sides of the tip left square. Any size screwdriver is adaptable to this sharpening.

In using the tool in a damaged screw head, first clean old burrs or

Window Panes Aren't Expensive

But REPLACING

Them Costs a Lot

How much does it cost to replace a broken window in *your* plant? Surveys show that the average cost, including labor—the big item—is $3.00 for a single 12″ x 18″ pane. The prevention of window breakage can mean a sizeable reduction in maintenance costs.

A good way to prevent breakage is to glaze with PLEXIGLAS acrylic plastic. This light weight, durable, *outdoor* plastic has the strength and resilience to withstand the enemies of industrial glazing—impact, twisting, and vibration.

PLEXIGLAS is available as clear transparent material, and in transparent and translucent colors which reduce direct sky glare, provide excellent diffusion of daylight, and curtail solar heat.

SEND FOR NEW BOOKLET. Our new brochure "Window Glazing with PLEXIGLAS", describes the advantages of this glazing material, and outlines installation methods. We'll be glad to mail you a copy.

PLEXIGLAS is a trademark, Reg. U. S. Pat. Off. and other principal countries of the Western Hemisphere

Canadian Distributor: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada*

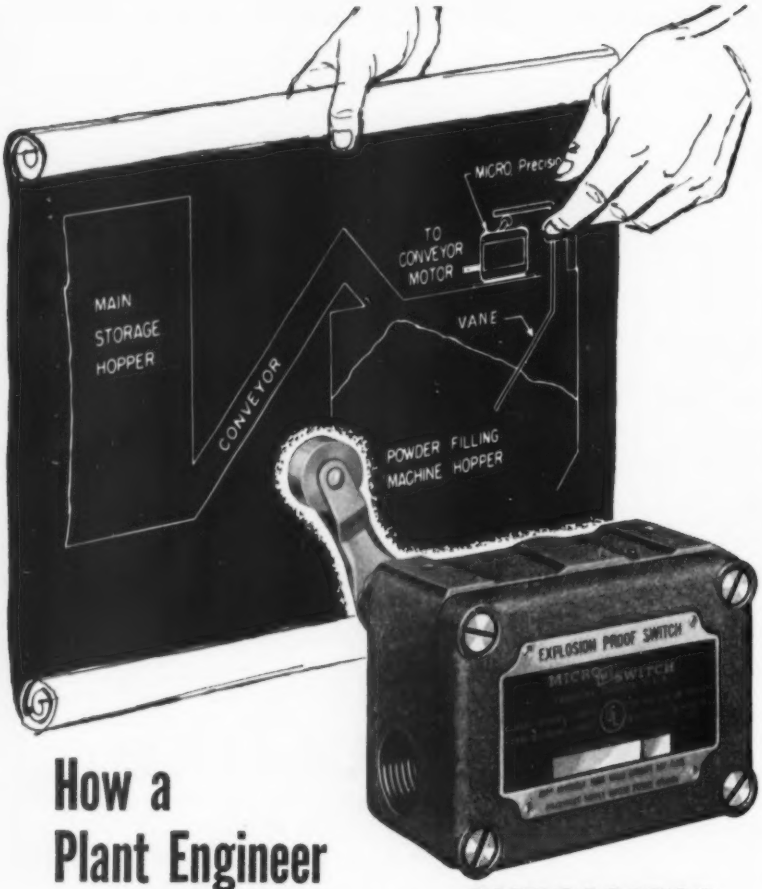
PLEXIGLAS is listed in Sweet's Plant Engineering File, Section 4a/Ro

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries



How a Plant Engineer made hopper-loading AUTOMATIC ...with a MICRO switch

● A Midwestern plant engineer installed an explosion-proof MICRO switch in the motor circuit of his powder loading conveyor.

As the hopper fills to the predetermined point, pressure of a pivoted actuating vane in the machine hopper operates the switch and halts the conveyor bringing powder from the main storage hopper.

This simple but important installation is typical of the thousands of uses that plant engineers are making every day of these versatile, precise snap-action switches to make present equipment safer, more automatic and more productive.

If you are looking for new ways to make existing plant equipment safer and more automatic, you will find a MICRO Authorized Distributor located near you with a full line of switches to meet a wide variety of applications. Look in your classified telephone directory under "Switches, Electric." Write for MICRO TIPS . . . a veritable gold mine of practical switch application ideas. We'll be glad to put you on the mailing list to receive it regularly.

MICRO MAKERS OF PRECISION SWITCHES
A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY
FREEPORT, ILLINOIS

For more facts circle 548 on Reply Card

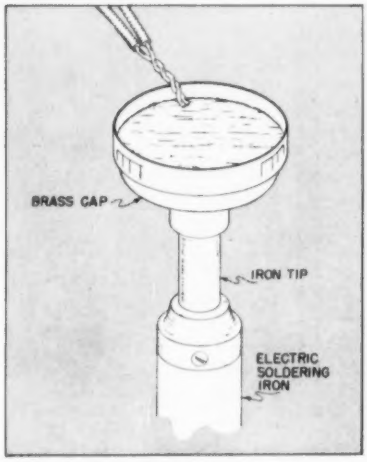
OPERATION & PRODUCTION

(O and P begins on page 56)

extra metal from the slot. Then, holding the screwdriver in a vertical position, press down hard, and twist firmly. The rounded, worn part of the slot will shear until the slot becomes squarely vertical with the head. The cutting action will then stop and the applied pressure will be used in moving the screw.

The grinding does not decrease the effectiveness of the screwdriver, since it can be used on new or undamaged screws without appreciable harm to the screw slot.

Soldering Pot



Brass light socket cap, press fit over soldering iron, makes handy solder pot

Lead Bonded to Steel by Machine

A HIGHLY VERSATILE automatic machine which will produce a perfect chemical bond between lead and steel has been announced by Knapp Mills, Inc. In one day, one small machine will clad a steel surface that would require 8 to 10 man-days to cover by hand techniques.

The steel is first prepared through leadizing and then lead of any desired thickness can be applied. The lead will not separate from the steel in service unless it is melted off at temperatures close to 621 F, the melting temperature of lead.

Machines of this type will chemically bond a strip of lead up to 12 in. wide by ¼ in. thick to prepared steel. The operator can control the width and thickness of the lead cladding by regulating the speed of the machine and by spreading or narrowing the two cladding heads with which it is equipped.

An important advance in design over earlier models makes it unnecessary for the machine to carry

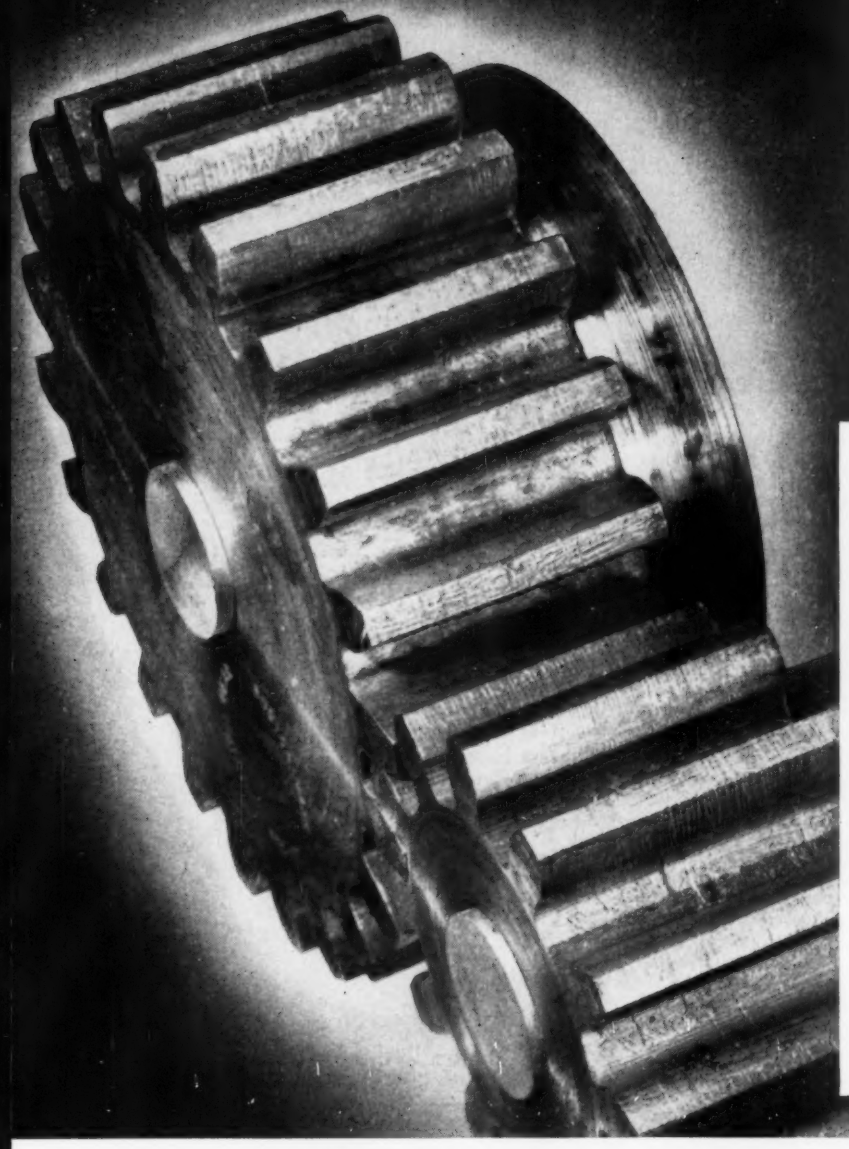
No Pressure Wipe-Off on Gears Lubricated with Sun 897 Grease

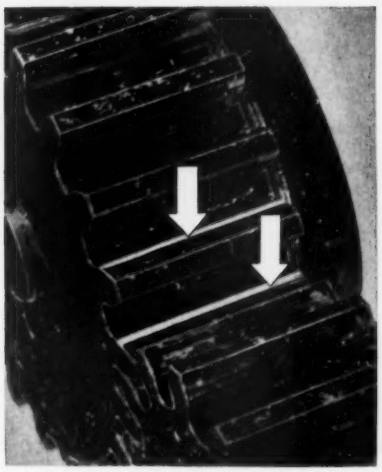
Even heavy tooth loading won't cause Sun 897 Adhesive Pressure Grease to squeeze out. It stays on the gears, prevents metal to metal contact, prolongs gear life, and reduces lubrication costs. Sun 897 is most valuable where *throw-off* with resultant wear and spotting of products must be avoided. It is easily applied with a brush on open gears, sprockets, chains, slides, cams, cables, couplings and linkages. For complete information, consult your nearest Sun representative or write Department PY-3.

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY • PHILADELPHIA 3, PA.
SUN OIL COMPANY, LTD. • TORONTO & MONTREAL

SUNOCO®

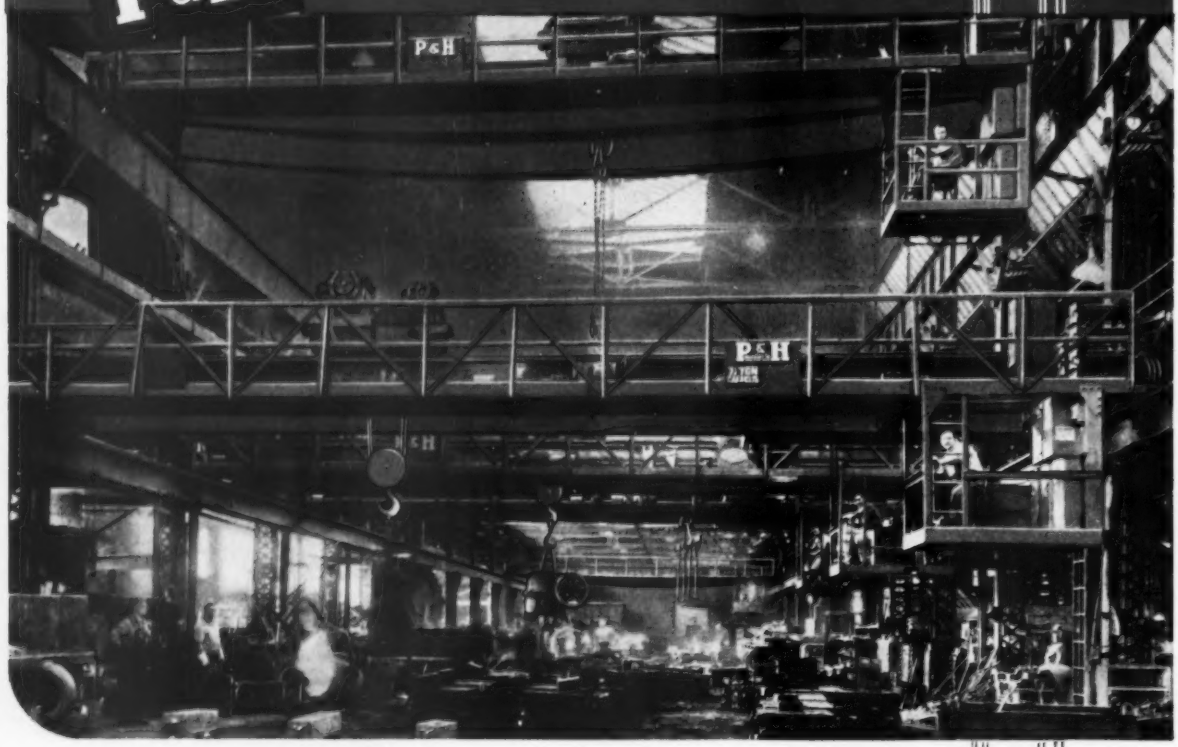




BLACK GEAR COMPOUNDS oxidize, harden and wipe off quickly under pressure. Arrows indicate where wipe-off of the compound has left the gears unprotected by a lubricant. Metal to metal contact causes excessive wear and thus materially shortens the life of gears.

NO SQUEEZE-OUT due to pressure. A thin, transparent film of Sun 897 Adhesive Pressure Grease stays evenly distributed on the gears and gives positive lubrication at all times. Sun 897 is water resistant and can be easily applied with a brush.

P&H OVERHEAD CRANES



Only P&H BUILDS

COMPLETE ELECTRICAL EQUIPMENT

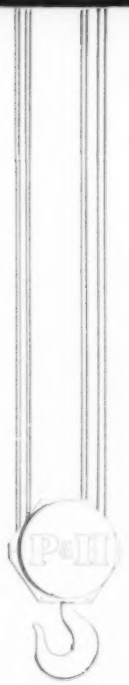
— designed specifically for Crane Service

You'll find a big difference in the crane electrical equipment built by P&H and that assembled from various sources. P&H designs it specifically for the severity of crane service. General purpose motors are not used. P&H has learned how to build crane motors through more than 50 years!

You'll find a big difference in performance—the entire crane is designed and built as a coordinated unit. P&H understands how to give you the utmost in faithful performance.

And you'll find a big difference in service when you need it. For only in this way can you put *all* the responsibility in the hands of *one dependable source*. There's no buck-passing among suppliers—no confusion or delays. P&H service is complete—reliable—alert. It will save you time and money. It's good reason for insisting upon P&H equipment throughout.

P&H ***MAGNETORQUE*** **® AC Crane Control . . . an exclusive P&H development which provides speed-load characteristics not excelled by any other type of control. You should have all the facts about it. Write us.**



P&H OVERHEAD CRANE DIVISION

HARNISCHFEGER CORPORATION

Milwaukee 46, Wisconsin

For more facts circle 550 on Reply Card

OPERATION & PRODUCTION

(O and P begins on page 56)

its own lead supply. A strip of lead is laid down under the machine; the cladding heads melt this lead and chemically bond it to the steel as the machine automatically moves across the plate. However, the machine will also carry its own lead supply in tubular feeds at the front of the unit. The machine will run free, directly on the steel, or it will operate on a track. By taking off the bottom carriage, reversing it, and mounting it on the top of the machine, the unit will run on a lightweight aluminum or magnesium beam so that it operates in a tank shell as well.

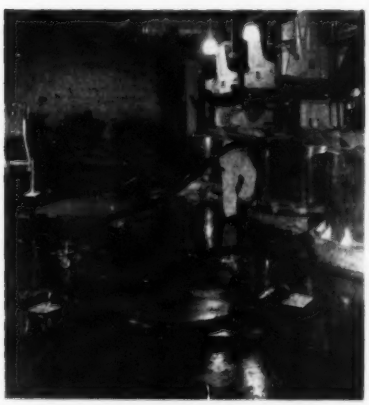
The whole carriage may be turned to clad lead on either the right or the left side. With all of its versatility and many functions, the unit weighs less than 15 lb. Even though the cladding heads direct intense heat on the lead and steel beneath them, the machine itself does not even become warm in operation.

A hand-operated model has also been designed, which may be used to burn lead to lead as in welding sheet lead and pipe. The hand unit, weighing less than 10 lb., operates without a carriage on a single wheel or tripod arrangement with a grip for the operator.

Rubber Hose Rides on Dollies

Contributed by Alfred Parker
Eastman Kodak Co., Rochester, N. Y.

A 2-INCH rubber hose — a long, cumbersome affair — is used at our plant to fill mixers with heavy chemicals. The mixers are grouped



Dollies attached to rubber hose make operator's job of moving hose easier

in one large room, where manufacturing conditions require that the floor be wet most of the time. It was quite a "bull" job, dangerous because of the wet floors, to drag the hose from one end of the room to the other, as the mixers were filled.

Small, two-wheeled dollies have been attached to the hose at 5-ft. intervals along its length. These assume a large part of the load of the hose, thus decreasing the operator's effort required to move the hose around the room.

Soldering with Foil

Contributed by Sidney V. Worth

FOR SMALL-JOB SOLDERING, when the usual tools for lead soldering are not available, some ordinary lead wrapping foil is a workable substitute. With the foil wrapped around the joint, a match flame generally provides sufficient heat to solder the joint.

Prior to wrapping the foil, scraping the pieces to be joined to make them as clean as possible will improve the soldered joint.

Electronic Leak Detector

A NEARLY FOOL-PROOF METHOD of finding leaks in anything from a coil of pipe to a huge distillation tank has been developed with a gas that once served only as the cold-making agent in refrigerators.

The test medium is Du Pont "Freon-12" fluorinated hydro-carbon which, under pressure, is a colorless, virtually non-toxic and odorless liquid, but which changes to a gas when released from pressure at room temperatures. Its use as a leak detector stems from its ability to seek out and escape through the finest openings in almost any material. The exact location of such leaks can be found quickly with an electronic device or a gas-burning torch whose flame changes color in contact with the nonflammable Freon.

Halide torches—small hand-held lamps in which methyl alcohol, acetylene, or propane burns with an almost invisible flame—have been used for many years to detect leaks of Freon in refrigeration systems. The sensitive flame turns green or blue-green in the presence of the gas, and experts can tell by the flame color just how big the leak is.

A more recent development is the electronic leak detector which is responsive to Freon or other gaseous halogenated compounds. The first of these, developed by General Electric, weighs only seventeen pounds and is approximately the size of a small portable typewriter.

Western Electric, manufacturing and purchasing subsidiary of the Bell Telephone System, is supplying a traveling version of the electronic tester. This instrument is pulled along on overhead telephone cables (under temporary Freon pressure) and signals leaks which, if not detected and cleared, might impair telephone service.

Another use is in the testing of

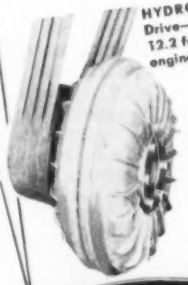
P&H ELECTRIC HOISTS
There's MONEY in the air!
In the average plant, materials handling accounts for 20% of the total cost of the product. How about your operation? Are skilled workers wasting your time and money being load-lifters? There's a better way —
Handle it "thru-the-air" FASTER—FOR LESS!
P&H can help you cut costs, with swift, safe movement of loads above floor congestion. There's a P&H Electric Hoist to suit your needs exactly; the Zip-Lift for loads up to 1 ton—the Hevi-Lift for loads up to 15 tons—available with hook, jib or trolley mounting. A P&H representative can show you where and how to save money.
Call your P&H Dealer
P&H ELECTRIC HOIST DIVISION
HARNISCHFEGER CORPORATION
MILWAUKEE 46, WISCONSIN
For more facts circle 551 on Reply Card

A Case of "SWEETER" PICKLING

THE COMPLAINT: At the Geo. D. Roper Corp. plant, Rockford, Ill., metal parts for Roper Gas Ranges are processed through a series of pickling operations by means of an 185 ft. continuous conveyor. Driven by two 1½ hp. motors about 90 ft. apart, the conveyor chain automatically stops at regular intervals to "dunk" range parts into the pickling tanks. Continuous start and stop operation caused the two motors, originally matched, to work against each other, resulting in repeated conveyor chain breaks and overtaxed motors.

THE REMEDY: A Twin Disc HYDRO-SHEAVE Drive was installed on each motor. With no change in loads or general conditions, motors no longer fight each other. Normal 4% fluid slip in the couplings results in smooth, steady operation, and an end to chain breakage. The Twin Disc HYDRO-SHEAVE Drive absorbs starting and overload shocks, allows the motors to build up to an efficient speed before picking up the load, and reduces wear on *all* working parts.

In thousands of applications—indoors and out—Twin Disc Industrial Fluid Drives are providing similar savings. For help on your problems, write Twin Disc or contact your nearest Twin Disc Hydraulic Dealer.



HYDRO-SHEAVE® Drive—Sizes 7.4s to 12.2 for motors and engines ¾ to 30 hp.

Built for a Long Life . . .
Backed for a Lifetime

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin · HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND · DALLAS · DETROIT · LOS ANGELES · NEWARK · NEW ORLEANS · SEATTLE · TULSA

For more facts circle 552 on Reply Card

OPERATION & PRODUCTION

(O and P begins on page 56)

complicated pipe coils or pressure vessels too large and cumbersome to be filled with compressed air and dunked in a liquid bath where escaping bubbles would indicate leaks. Tests on tanks as high as a two-story building are completed by filling them with a mixture of Freon and air, then carefully inspecting likely leak points, such as joints, fittings, or welds, with one of the electronic "noses."

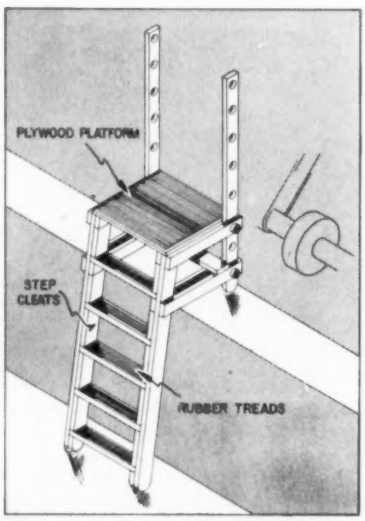
With the increasing use of radiant heating systems in home and industry, the small, portable Freon detector is finding its way into the tool kit of the heating contractor. Instead of actually placing the heating system in operation to test its tightness—with the possibility of water damage to construction if a leak exists—many contractors are using the electronic sniffer to give a safe, reliable, dry test.

Adjustable Ladder for Odd Jobs

Contributed by Charles H. Willey

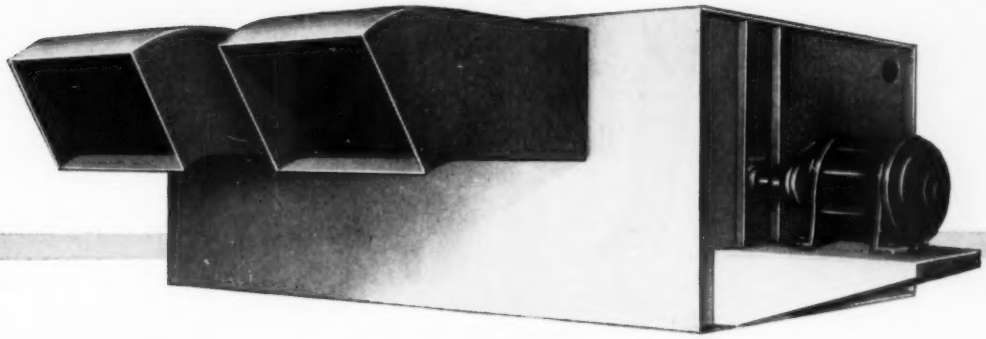
FREQUENT MAINTENANCE work where the regular type of step ladder was not suited to safe and convenient work led to our building adjustable rear legs for one of our platform step ladders.

The two adjustable legs can be set for the same height, or where necessary, at different lengths where one leg can be supported at a different height from the other. Special legs have been made up to adapt the ladder to unusual overhaul jobs. Cleated step construction, together with the rubber-treaded steps, add safety and durability to the ladder.



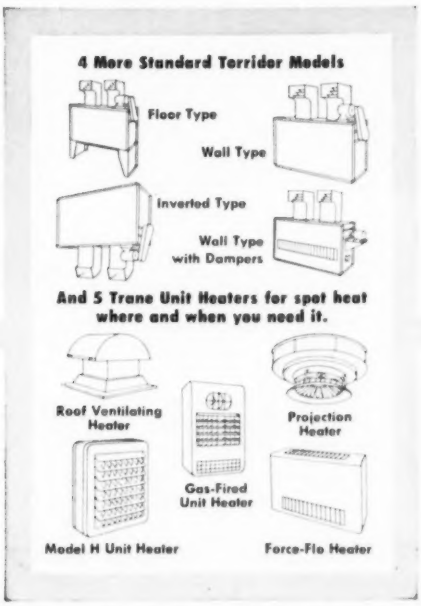
Hole spacing on rear legs of step ladder permits adapting ladder to work height

Here's why Trane Torridors can be tailored to fit so many heating jobs!



These *standard* TRANE accessories can be combined with any *standard* TRANE Torridor to solve any heating, ventilating, air filtering or process problem.

- **Many coil types . . .**
  High or low pressure steam—Hot water —Standard or "non-freeze" SD type
- **20 Nozzle arrangements**
- **Wide choice of filters and frames**
- **Two types of by-pass dampers**
- **Mixing and intake boxes**



Now you can have Engineered Heating to solve problems like these with a standard TRANE Torridor!

1. Drafty doorways. Use basic Torridor heating section with nozzles and door switch. Positive blanket of heat every time door opens.

2. Negative pressure. Use Torridor with SD "non-freeze" coils and filter section to introduce fresh tempered air. Maintain positive pressure. Eliminate cold air leaks.

3. Close temperature control. Use Torridor with face-and-by-pass and/or modulated steam distributing coils. Tempers chilly morning air . . . permits mild midday air to enter without overheating.

4. Explosive atmosphere. Use Torridors with spark-resistant fans and explosion-proof motors. Many other variations available.

5. Need for quick warm-up. Use mixing box on Torridor. Fresh air dampers close for quick warm-up—modulate to mix ventilation air with room air.

6. Process heating or drying. Torridor has ample room for three rows of high output coils for process heating or drying applications.

7. Compact central system. The powerful centrifugal fans of the Torridor can deliver large quantities of air through duct systems.

8. Ventilation. Use Torridors for ventilation all year. In the summer, Torridors circulate outside air. In the winter, tempered air.

Problems of fog removal, ice melting, drying, curing and many others can be solved with TRANE Torridors . . . automatically, with standard pneumatic or electrical controls. See your consulting engineer or TRANE office. Write TRANE, La Crosse, Wis., for Bulletin DS-327A.

TRANE Torridors

The Trane Company, La Crosse, Wisconsin • East. Mfg. Div., Scranton, Pennsylvania
Trane Company of Canada, Ltd., Toronto • 80 U.S. and 14 Canadian Offices

TRANE—MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

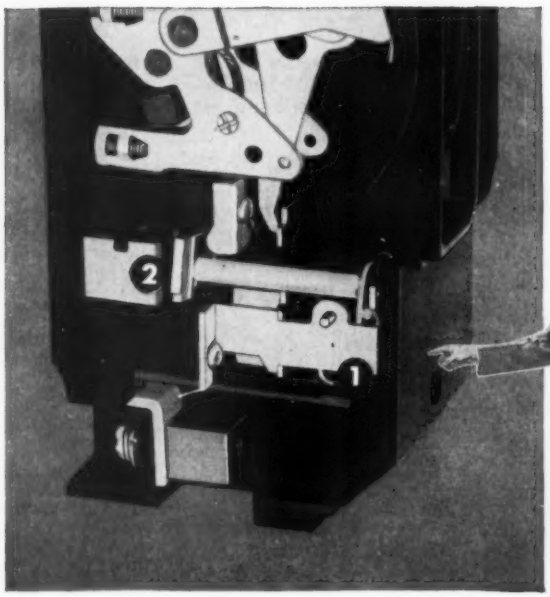
For more facts circle 553 on Reply Card

THREE REASONS

Why modern plants need modern I-T-E circuit breaker protection

Vital power arteries *doubly protected*

When you install modern, industrial-type I-T-E Circuit Breakers on vital power, lighting, and distribution circuits, you get positive 2-way protection. You get protection against both short circuits and overcurrents. Breakers are pretested and calibrated to trip at precise, known limits.



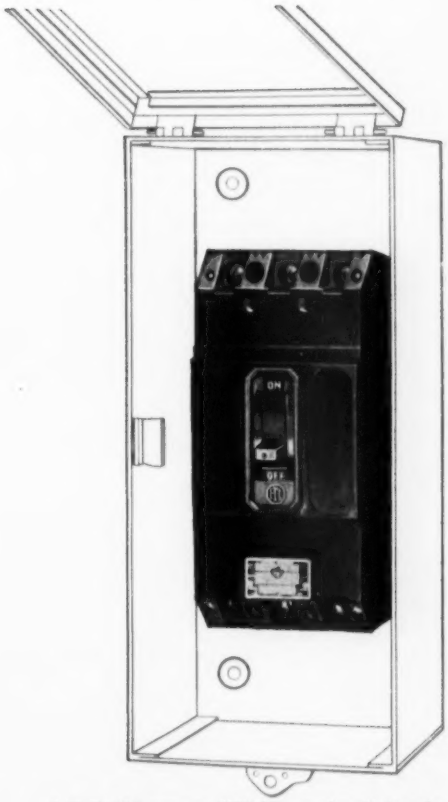
1. *Thermal time-delay trip* provides dependable overcurrent protection. Prevents circuit interruption on harmless overloads.

2. *Magnetic instantaneous trip* assures split-second tripping on short circuits.

Service restored . . . *in seconds*

If an I-T-E breaker trips on a fault, service is restored *in seconds*. Merely resetting the operating handle permits production to continue. There's no waiting, no excessive downtime. And remember—if a breaker trips *just once*, it may pay for itself in the production time it saves!

Three-position operating handle indicates at a glance whether breaker is ON, TRIPPED, or OFF. No specialized personnel required to restore service. *Anyone* can reset breaker quickly.



I-T-E 100-ampere "F" frame circuit breaker in Nema Type 1-A sheet steel enclosure.

First cost the last

Once you've installed an I-T-E Circuit Breaker, there's no continuing expense—each time there's an interruption. I-T-E breakers are compact and self-contained. They are built to last indefinitely. There's no deterioration, no fussing with replacement parts. And a breaker provides maximum safety.

I-T-E Molded Case Circuit Breakers come in four frame sizes, 4 enclosures. Available in ratings from 10 to 600 amperes, up to 600 volts a-c, up to 250 volts d-c. For details about the complete I-T-E line, send for a copy of Bulletin 5108-D or contact your nearest I-T-E representative.

I-T-E

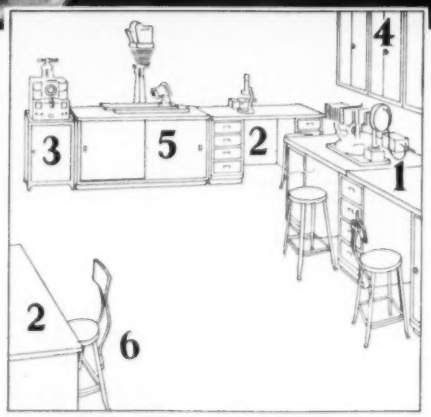
MOLDED CASE CIRCUIT BREAKERS

I-T-E CIRCUIT BREAKER COMPANY • 19TH AND HAMILTON STREETS • PHILADELPHIA 30, PA.

For more facts circle 554 on Reply Card

A METALLURGICAL LAB — CUSTOM BUILT with Standard HALLOWELL Shop Equipment

It's easy to custom build a laboratory, toolroom, gage room or assembly line with standard HALLOWELL Steel Shop Equipment. Just lay it out as you want it—then order standard, ready-made units from your local HALLOWELL distributor. Let us send you complete information. SPS, Jenkintown 26, Pa.



1. Continuous Unit Bench
2. Individual Unit Benches
3. Tool Cabinet
4. Wall Cabinets
5. Cabinet Bench
6. Stools and Chairs

Our Fiftieth Year : A START FOR THE FUTURE

HALLOWELL SHOP EQUIPMENT DIVISION SPS JENKINTOWN PENNSYLVANIA

For more facts circle 555 on Reply Card

Now... they're even PUMPING POTATO SALAD!

An example showing how the versatile MOYNO PUMP may solve your pumping problem

As you can imagine, any conventional pump would quickly make *mincemeat* out of potato salad! But not the versatile MOYNO Pump! In fact, this unique pump was the answer to a years-old materials handling problem in an Eastern food processing plant.

Why? Because of the Moyno "*progressing cavity*" *principle*—found in no other pump. Instead of valves and pistons that stick, or vanes that cause churning and turbulence, the Moyno has a simple rotor, operating within a stator. The small illustration shows how progressing cavities are formed as the rotor turns. These cavities move along smoothly, without closing up or squeezing the material. That's why Moynos carry liquids, pastes, solids in suspension, abrasive-laden slurries—*almost anything that will go through pipe*—with positive, non-pulsating pressure!

Potato salad is only one of the many successful, dramatic applications for Moyno Pumps. You may be able to save money or solve a problem by finding out more about the world's simplest, most versatile pump!

If you have a pumping application—in your plant or in your product—write today for free copy of Bulletin 30-PE. It will give you complete facts!

Features of the MOYNO that may solve YOUR pumping problem

Positive Displacement—Moynos are available to pull up to a 29" vacuum while discharging under pressure. Big Moynos deliver up to 250 g.p.m. at pressures to 600 p.s.i.

Gentle—no churning; won't break up semi-solids . . . won't aerate liquids.

Reversible—pumps with equal efficiency in either direction.

Trouble-Free—self priming; won't cavitate or vapor-lock. Just one moving part—no valves to stick, no pistons to gum up. Built for tough service. Easy to maintain.

ROBBINS & MYERS, INC.

SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

Fractional & Integral h.p. Motors & Generators

Electric Fans

Electric & Hand Hoists & Cranes

Moyno Pumps

Propellair Industrial Ventilating Equipment

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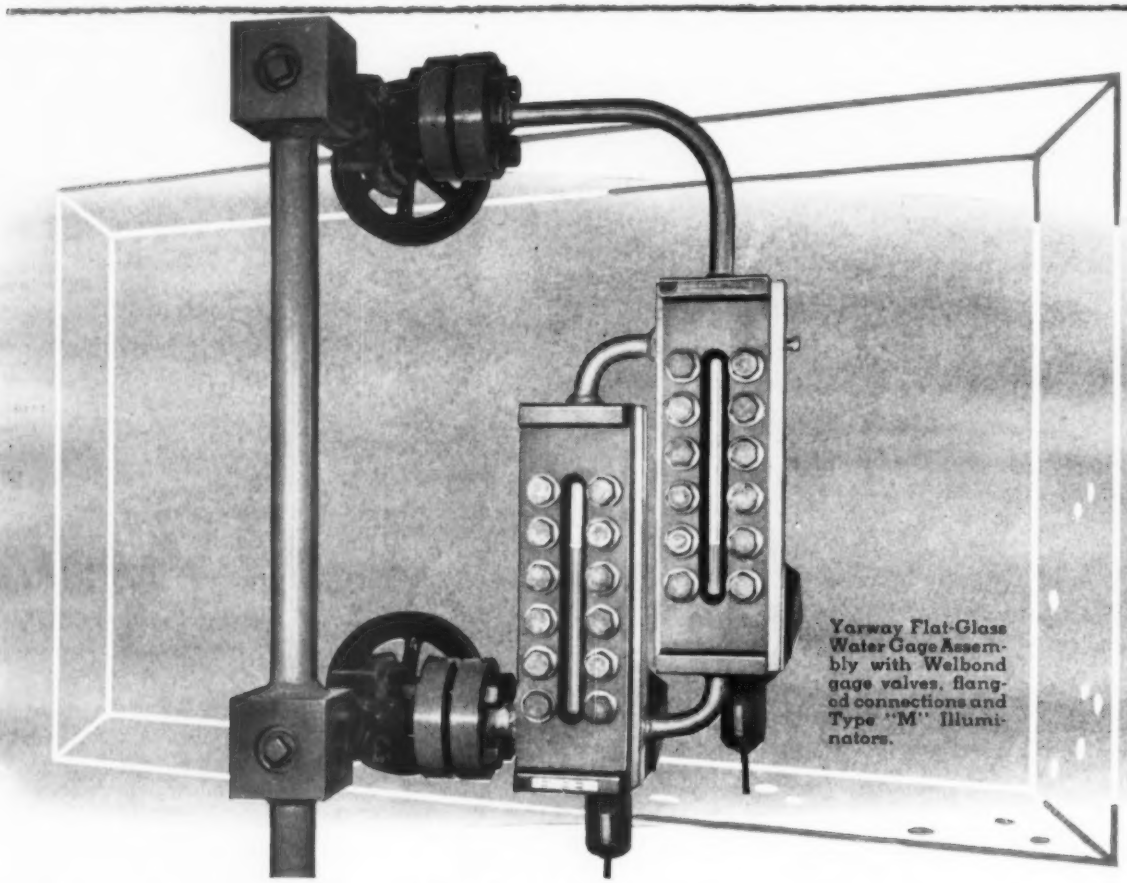
What's New

IN BOILER WATER LEVEL INDICATION?



Yarway Flat-Glass Water Gage Assembly with Welbond gage valves, flanged connections and Type "M" Illuminators.

NEW *SEPARATED-DESIGN* WATER GAGES

This new Yarway water gage assembly has been developed to meet the demands for greater dependability, longer life, and more accurate readings in high pressure service.

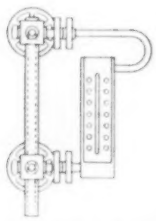
The gage glass inserts are of the Yarway pressure-sealed "floating assembly type". Yarway Welbond gage valves are used. Greater flexibility is gained by using two independent inserts, and by interconnecting expansion loops (see above).

The short connection to the drum assures greater accuracy of the gage reading, and the lower flanged connection eliminates a stuffing box. The upper flanged loop connection between the insert and gage valve allows expansion and contraction of the various components.

The tie bar-type water column linking the gage valves provides circulation to keep gage nearer drum temperature.

Yarway Type "M" Illuminators on the gage inserts cause the meniscus at water level to "shine like a star". This illuminator is especially effective in penetrating deposits on gage glass, dust particles in air and extraneous light.

For full information, write for Yarway Bulletin WG-1811.



Yarway Single Insert type gage for medium range of visibilities.

YARNALL-WARING COMPANY • 145 Mermaid Ave., Philadelphia 18, Pa.

YARWAY STEAM PLANT EQUIPMENT

Photos: ITE Circuit Breaker Company

Fig. 1. Overload testing of 600 amp circuit breakers where 200 per cent of the rated current is passed through the breaker. This is one of several tests to which all breakers are subjected in their calibration

What CIRCUIT BREAKER RATINGS Mean to YOU

By ANDREW W. KRAMER, Electrical Editor, Plant Engineering

FEW THINGS in the electrical industry are basically so simple yet so important as the circuit breaker. A circuit breaker is essentially a switch—a switch which operates automatically, usually when some abnormal condition arises in the circuit. It is a protective device. A simple knife switch is a manually operated circuit interrupter. Suppose a man were to be stationed before such a knife switch and have continually to keep his eyes on an ammeter connected in the circuit. Normally he would do nothing, just sit, but if the current began to rise below a safe value he would pull the switch and so open the circuit. In this case, the man, his eyes, his nervous system and the switch constitute an automatic circuit breaker. The arrangement constitutes what regulator engineers call a *closed sequence*.

As a means of circuit protection this arrangement of man and switch has many shortcomings. First, it is bulky. More important, it is inaccurate, unreliable, and inordinately expensive. At prevailing wage rates, the man would probably have to be paid $8.00 a day, and if 24-hour protection was necessary, three shifts would cost $24.00 a day. The man moreover would not be able to keep his attention on the meters; his eyes and thoughts would wander, he might fall asleep. In case of a short circuit it is unlikely that he could act fast enough. It would be a poor arrangement from every standpoint.

Very early in the development of the electrical art it was obvious that a more practicable method of circuit protection would be obtained merely by incorporating a weak link in the circuit at a conveniently accessible point. This was the fuse, at first simply a short piece of lead wire. This automatically opened the circuit when the lead wire melted.

Fuses were satisfactory protective devices and they are still in wide use in many types of electrical circuits but it was obvious, almost from the very beginning, that an automatic switch could be devised which would also open the circuit under abnormal conditions. All that was needed was a switch tending to be held open by the action of a

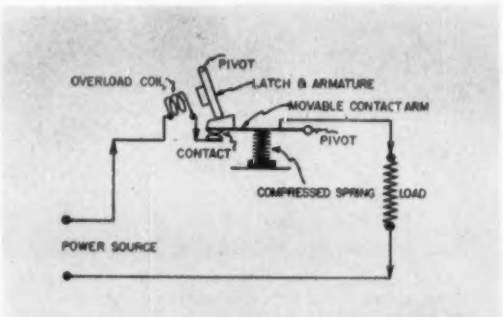


Fig. 2. The basic construction of a circuit breaker. When an overload occurs, the overload coil pulls in the armature, releasing the latch and opening the contacts. A similar action occurs when a thermal element is used in lieu of or in conjunction with an overload coil

Fig. 3. The tripping travel of the armature assembly is set by an adjusting nut on the armature. The air gap between the armature and magnet is checked against predetermined clearance figure for an initial setting before final calibration

Fig. 4. An adjusting screw for time delay calibration of the thermal element is added to each pole. Armature springs, to return the armature to the open position after a tripping operation, are also attached at this stage of the assembly

spring but which normally was held closed by a latch which could be tripped by an electromagnet. The electromagnet being in series with the switch would trip the latch on overcurrent and so open the circuit.

The basic construction of a circuit breaker is shown in Fig. 2. When an overload occurs the overload coil pulls in the armature, releasing the latch and opening the contacts. A similar action occurs when a thermal element is used in lieu of or in conjunction with an overload coil. The first requisite of a circuit breaker or any other protective device is that it *not* interrupt service until such time that damage to the circuit or associated equipment would occur if the circuit remained closed.

The early circuit breakers were relatively crude devices but they served their purpose because in those days most electrical equipment was generously designed with a high *factor of ignorance*. Ratings of motors and generators were ample and heavy overloads usually did not damage them. As electrical equipment design developed, however, tolerances became smaller, and at the same time the increased use of electricity brought about greater concentrations of energy. This made short circuits more destructive, and the problem of circuit protection more important. Circuit breakers and fuses were developed to operate within narrower limits and at the same time to interrupt currents of greater magnitude.

Fig. 5. Circuit breakers are adjusted for calibration in a room where the temperature is controlled at a constant 25 C. Final calibration and tests on the circuit breakers are in exact accordance to the Underwriters' Laboratories specifications

Today the circuit breaker is a highly developed, accurate and reliable piece of equipment with highly uniform operating characteristics. They are built in sizes and capacities which range from tiny units handling milliamperes to great outdoor types as big as a house and capable of handling 10 million kva.

During the course of circuit breaker development there has been considerable controversy concerning the comparative merits of fuses and circuit breakers. Each class of equipment had its adherents. These arguments have now virtually disappeared and it is generally recognized that there are places where fuses should only be used, as in instrument circuits, and other places where circuit breakers must be used, as in battery circuits for reverse current protection.

At the present time circuit breakers are used to an increasing extent in every branch of industry. Their convenience is so well recognized that it requires little comment. In case of abnormal conditions the circuit breaker opens, and to restore service after the fault has been cleared it is only necessary to reclose the breakers by means of the

conveniently located handle. This reduces outage time of machines and consequent loss of production.

Even more important though perhaps less generally recognized are the uniform operating characteristics of circuit breakers. When made by reputable manufacturers and approved by the Underwriters' Laboratories, circuit breakers are calibrated to trip within certain limits thus assuring positive protection of circuits and machines. Indeed, few users of circuit breakers in industry probably realize how much care and engineering effort goes into the manufacture and calibration of even the average small industrial breaker nor do they appreciate the significance of the Underwriters' Laboratory (UL) label on such breakers.

The Underwriters' Laboratories label on a circuit breaker, or indeed on any other piece of electrical equipment, is the users assurance that it is designed to operate within certain prescribed safe limits. It means that the breaker has been accurately calibrated at the factory under rigid standards and that it belongs to a class of devices which is subject to periodic spot check by the UL test engineers.

It may be of interest at this point to say something about the Underwriters' Laboratories. The Underwriters' Laboratories, Inc., is a non-profit organization operating on a national scale with electrical laboratories in New York, Chicago and San Francisco. It is a competent, highly skilled, reliable, and progressive organization which, in cooperation with industry, has developed safety standards for material and equipment. The Laboratories examine products of manufacturers by tests of prototypes or by periodic spot checks of normal requirements of the UL standards.

This means that a manufacturer making a product carrying the UL label must not only adhere to the standards set up by the Laboratories but must be prepared to have any unit taken from the production lines for rigid tests by the Laboratories' engineers.

This assures the user of circuit breakers or other electrical equipment that units of a given rating will perform within the limits of those ratings. This must be so because if a circuit breaker removed from a production line should fail to measure up to the Underwriters' Laboratories requirements, the production of that particular line of breakers would have to cease until the defects are rectified. This would necessarily be expensive for the manufacturer and it is understandable that manufacturers operating under the UL supervision would make every effort to meet the requirements set up by the Laboratories.

The accompanying photographs show various operations in the manufacture, adjustment, and calibration of industrial circuit breakers. This particular manufacturer turns out many thousands of small, medium size and large industrial circuit breakers a year, yet each breaker after undergoing various mechanical adjustments is subjected to a variety of calibration tests, depending upon the size and type of breaker. This means that each breaker, when it leaves the factory is in perfect adjustment to carry normal load and to interrupt overload currents in the required time.

It is obvious that these circuit breakers when once installed in the factory should not be tampered with so far as their adjustment is concerned. Indeed, one of the requirements of the Underwriters' Laboratories for branch circuit and service circuit breakers is that the tripping mechanism be sealed to prevent tampering. This is an important requirement because it assures the user that the calibration adjustments made at the factory will continue to be accurate during the useful life of the breaker. If such units were not sealed it might be possible for maintenance men to intentionally or unintentionally alter the rating of breakers and thus jeopardize the safety of men and machines in the plant. A circuit breaker is not merely a device to open a circuit on overload, it is a device that opens the circuit on overloads of *certain magnitudes* in *certain specified times*. The purchaser of a circuit breaker made by a manufacturer operating under the Underwriters' Laboratories supervision can be sure that the particular circuit breaker he purchased will protect his equipment.

Circuit breakers, of course, must be installed in places where proper service conditions prevail. Certain conditions affect the operation of air circuit breakers, ambient temperature and altitude for example. Molded case circuit breakers are for use where the ambient temperature does not usually exceed 40 C. Their use under conditions of higher temperature may affect their tripping time. Also, they should not be used at altitudes higher than 6000 ft. Operation above this level would affect their current and voltage ratings.

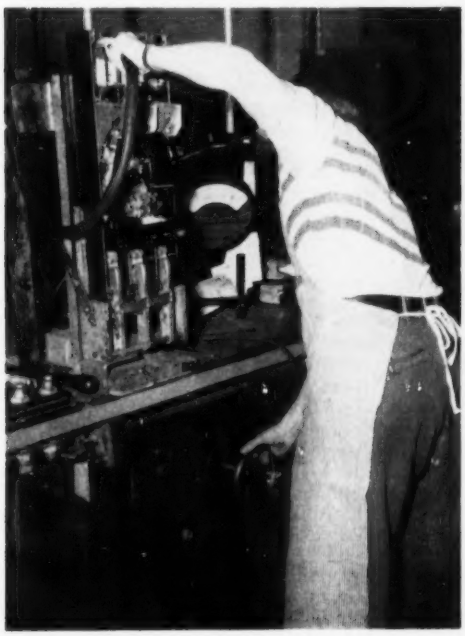


Fig. 6, Left: Instantaneous tripping is tested at 1900 minimum to 3500 maximum ampere settings for a 600 amp circuit breaker as shown

Fig. 7, Below: Circuit breakers are mechanically adjusted before final calibration. Bimetal adjustment is accomplished by an adjustment screw

Top left: First term students in engineering drawing, with Elmer E. Petty, Head, Department of Drafting. Top right: Group of seniors listening to Guest Lecturer G. W. Wright, patent attorney, as part of engineering law course. Bottom left: Student demonstrates cutting while classmates watch. Bottom right: Instructor explains flowmeter to Student Dale Morse

Milwaukee Industry and College Establish Plant Engineering Course

Milwaukee School of Engineering, "in partnership with industry," has established courses leading to a BS degree in Mechanical Engineering with a major in Plant Engineering . . . Concentric curriculum one of unique features

A PLANT ENGINEERING course "with a difference" has been instituted at Milwaukee School of Engineering. The second engineering college in the country to make such a course available[1] Milwaukee School of Engineering is the first to do so "in partnership with industry."

This phrase is more than a mere stringing together of words. Members of the Board of Regents of this non-stock, non-profit corporation are elected from among members of the Corporation who are major executives from the industries which employ the graduates of the School. The Board, which includes the School officers, establishes the top policy of MSOE. In addition, academic procedures are shaped by the Industrial Advisory Committee which plans the original courses and continually reshapes them to meet the dynamic requirements of future industrial employment. It was the need for trained plant engineers, foreseen by Milwaukee industry, which led to the formation of the new courses.

Before describing the Plant Engineering course in particular it would be best to review some of the ideals and foundations of the school; it was these which first attracted the attention of the outstanding industrialists and businessmen who now form its corporation and advisory committee. (See listing on opposite page.)

The philosophy and present program of the school are based on the personal experience and foresight of the founder, Oscar Werwath, a product of the Technical Institute of Mittweida, a watchmaking apprentice, and a classical student. It was in Milwaukee that he saw the opportunity for his school in electrical power and telephony and it was here that he founded it in 1903. The School filled a definite need with its molding of curricula around the needs of industry, its realization of need for a balanced education for technical men, plus its availability to men from modest family surroundings.

[1] California Institute of Technology was the first. See "Plant Engineering Goes to College," March, 1952, PLANT ENGINEERING.

Out of all these experiences came the School's unique but proven "concentric curriculum," the details of which are shown in the accompanying diagram. The concentric curriculum is a system of engineering education which pursues the same ultimate objectives as other institutions of higher learning but offers in addition several distinct advantages.

For example, the Plant Engineering curriculum consists of a service level course in refrigeration or heating. In from 3 to 12 months a student prepares himself for employment in technical services as is required of a refrigeration or heating service man.

If the student wishes he may continue through a technician curriculum, and an engineering course with functional electives in the field of production and manufacturing. Thus, the student in Plant Engineering is provided not only with a basic collegiate engineering education but, in addition, with practical technical specialties of the technical institute type in electric power, refrigeration, heating and air conditioning and with practical skilled "know-how" in the use of hand and power tools and in the application of science to production procedures.

Those students who successfully complete the service level program with a grade point average of 1.5 out of 3 or better may continue in the technical institute type of courses and in 12 to 18 months fulfill the requirements for engineering technician occupation while, at the same time, he completes the first third of the requirements for the degree of Bachelor of Science. Industry requires some five technicians for every engineer and there is a specially acute shortage of engineering technicians, those workers who can act as aides to the engineers.

The student at MSOE may elect to enter industry at this engineering technician point. If, however, he has successfully pursued this technician program with a grade point of 1.25 or better, he may continue toward the Baccalaureate degree. Here, again, the student may terminate his schooling to enter industry or he may continue if he has a grade point average of 1.75 or better, toward higher degrees.

The sub-committee on the Plant Engineering course consists of Irvin J. Haus, Chairman, Manufacturing Engineer, Line Material Company; M. R. Paulsen, Development Engineer, Burner Division, Cleaver-Brooks Company; P. W. Eels, Vice President, Le Roi Company; Lawrence E. Peterson, Consulting Engineer; Arnold H. Nielsen, Director of Training, Wisconsin Electric Power Company; Burnett M. Kluge, Chief Engineer, Bayley Blower Company; George H. McKenzie, Supervisor of the Material Handling Department, Ladish Company.

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Roy W. Johnson—President, A-P Controls Corporation
Arthur C. Keene—Vice-president, Wausau Iron Works
Charles H. Klinger—Manufacturer (retired)
James H. Kuehn—Vice-president, Wisconsin Cold Storage Company
T. O. Liebscher—President, Le Roi Company
M. J. Maiers—Manager, Sales Service Department, Commonwealth Edison Co.
James B. Morrison—President, Wisconsin Telephone Company
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Mrs. Greta W. Murphy—Dir., Pub. Rel., Milwaukee School of Engineering
William C. Scott—Vice-president and Division Manager, Evinrude Motors
A. C. Schmidt—Coordinator, Milwaukee School of Engineering
E. W. Seeger—Vice-president in Charge of Development, Cutler-Hammer, Inc.
J. H. Smith—General Manager, X-ray Department, General Electric Co..
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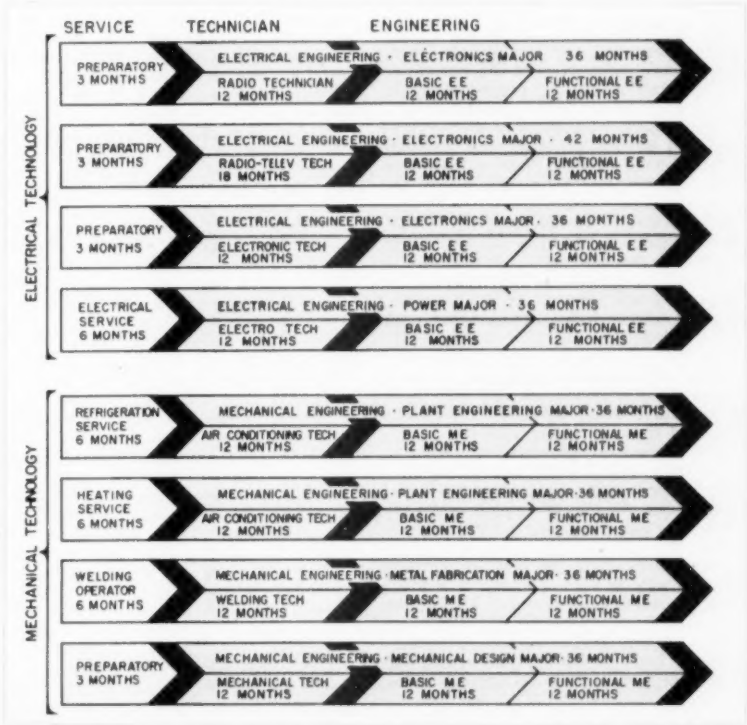
Mrs. Hannah S. Werwath—Asst. Treas., Milwaukee School of Engineering
Arthur A. Wetzel—President, Wetzel Brothers


SERVICE
TECHNICIAN
ENGINEERING
ELECTRICAL TECHNOLOGY
PREPARATORY 3 MONTHS
ELECTRICAL ENGINEERING · ELECTRONICS MAJOR 36 MONTHS
RADIO TECHNICIAN 12 MONTHS
BASIC EE 12 MONTHS
FUNCTIONAL EE 12 MONTHS
PREPARATORY 3 MONTHS
ELECTRICAL ENGINEERING · ELECTRONICS MAJOR · 42 MONTHS
RADIO-TELEV TECH 18 MONTHS
BASIC EE 12 MONTHS
FUNCTIONAL EE 12 MONTHS
PREPARATORY 3 MONTHS
ELECTRICAL ENGINEERING · ELECTRONICS MAJOR · 36 MONTHS
ELECTRONIC TECH 12 MONTHS
BASIC EE 12 MONTHS
FUNCTIONAL EE 12 MONTHS
ELECTRICAL SERVICE 6 MONTHS
ELECTRICAL ENGINEERING · POWER MAJOR · 36 MONTHS
ELECTRO TECH 12 MONTHS
BASIC EE 12 MONTHS
FUNCTIONAL EE 12 MONTHS
MECHANICAL TECHNOLOGY
REFRIGERATION SERVICE 6 MONTHS
MECHANICAL ENGINEERING · PLANT ENGINEERING MAJOR · 36 MONTHS
AIR CONDITIONING TECH 12 MONTHS
BASIC ME 12 MONTHS
FUNCTIONAL ME 12 MONTHS
HEATING SERVICE 6 MONTHS
MECHANICAL ENGINEERING · PLANT ENGINEERING MAJOR · 36 MONTHS
AIR CONDITIONING TECH 12 MONTHS
BASIC ME 12 MONTHS
FUNCTIONAL ME 12 MONTHS
WELDING OPERATOR 6 MONTHS
MECHANICAL ENGINEERING · METAL FABRICATION MAJOR · 36 MONTHS
WELDING TECH 12 MONTHS
BASIC ME 12 MONTHS
FUNCTIONAL ME 12 MONTHS
PREPARATORY 3 MONTHS
MECHANICAL ENGINEERING · MECHANICAL DESIGN MAJOR · 36 MONTHS
MECHANICAL TECH 12 MONTHS
BASIC ME 12 MONTHS
FUNCTIONAL ME 12 MONTHS

Concentric curriculum is one feature of engineering courses at this college

HERE'S HELP WITH A TOUGH PROBLEM

PSYCHROMETRY MADE USEFUL for the PLANT ENGINEER

How can it help you . . . ? In problems concerning exhaust systems, comfort or production air conditioning, condensation, humidity control, air conveying, drying, product moisture regain, heating, ventilating . . . Psychrometry is used, or should be, in selection of fans, grilles, filters, coils, radiators or air washers . . . Many hours of work went into this compilation, by the author for his own use, of the values presented in these tables

By **BYRON ENGELBACH**, Plant Engineer*

THE PROBLEMS of the plant engineer become more diversified and complex with each passing year. One of the more important substances with which he works is the normal atmosphere composed of air and water vapor. The plant engineer should have a better than speaking acquaintance with psychrometrics.

The normal atmosphere is used as a thermodynamic working medium in all heating, ventilating and air conditioning operations. In problems concerning an exhaust system, comfort or production air conditioning, condensation, humidity control, air conveying, drying, product moisture regain, the basic working substance is air plus its load of water vapor.

In the selection of a fan, exhaust grille, filters, coil, radiator or airwasher, the physical properties of the gas vapor mixture as it enters, passes through, and leaves the equipment plays an important part. Obviously, an understanding of the physical and thermal properties of the ambient atmosphere is a fundamental requirement for the plant engineer today.

Psychrometry is the study of air and water vapor. When "the psychrometric properties of air" are referred to, a reference is made to all the properties of air that are affected by the presence of more or less water vapor mixed with the original dry air. The ambient atmosphere consists of a mechanical mixture of gases plus a variable quantity of water. It is an accepted fact that there is no such thing as air without the slightest trace of water vapor.

The normal atmosphere composed of a mixture of gases, acts as, and has specific properties equivalent to a homogeneous gas. To all intents and purposes, the plant engineer may then consider the atmosphere as a gas-vapor mixture and it can be treated thermodynamically as such a mixture. For all psychrometric purposes dry air can be considered a perfect gas. It has been found that Dalton's Rule as a fundamental law of nature is erroneous. However, much work and research has been done in establishing tables and data for the thermodynamic properties of air. Once these tables are available to the plant engineer and he is able to use them comprehensively, he need not worry about the complications involved in following a correct procedure for arriving at usable data or tables.

The table, portions of which accompany this discussion, is basically the table presented in the 1949 Heating, Ventilating, Air Conditioning Guide interpolated to 0.1 of one degree for the purpose of eliminating to a great extent interpolation calculations by the user. The table, in its entirety, shows saturated water vapor mixed with air at various temperatures from 0 to 200 F. For each temperature the corresponding saturation pressure for steam is shown in inches of mercury, millimeters of mercury and psia, and indicates the partial pressure caused by the water vapor.

The mixture of water vapor and plain dry air is such as to result in a total pressure of 14.7 psia throughout the full table. In other words all calculations involved in computing the data contained in the table are based on standard atmospheric pressure of 29.921 inches of mercury. Correction should be made to table data when atmospheric pressure varies from the standard.

For each temperature shown in the psychrometric table, the vapor pressure of the water vapor which corresponds to that particular temperature is shown. The relative proportions of dry air and water vapor are shown in several ways such as Volume, Heat Content, Entropy, etc. Moist air may now be considered by the plant engineer as a mixture that obeys Dalton's Law with close enough accuracy to discount the slight discrepancies. The water vapor is "dry saturated steam" for each temperature shown in the table.

The following deductions can be made:

1. If the mixture is cooled, some water vapor will condense until saturation quantities for the new temperature are reached.
2. If the mixture remains at the same temperature no more water can be added since it already is 100 per cent saturated.
3. If the mixture temperature is increased, more water can be added until the mixture arrives at complete saturation, the vapor pressure will be increased, as will the total heat of the mixture.

The Psychrometric Table

The plant engineer is now ready to analyze the psychrometric table as presented. The first thing is to carefully observe the headings and compare with the table showing letter symbols used in the chart.

In Column No. 1, the temperature figures shown in degrees Fahrenheit represent the temperatures of 100 per cent saturated air. Opposite this temperature are those conditions of the air pertinent to the specific temperature, such as Vapor Pressure, Weight of the Moisture, Volume, Heat Content, Entropy, etc.

In Columns No. 2, 3 and 4 are shown the pressure of this Saturated Vapor. Usually tables show these data in inches of mercury. For purposes of comparison and ease of understanding, the data also show pounds per square inch and millimeter of mercury. Certain engineers prefer to work in one or the other medium. There is a definite trend in the use of inches of mercury to designate the vapor pressure. The relation of these three columns is of interest. 1.0 pound per square inch = 2.03 inches of mercury = 53 millimeters of mercury.

Thus, at 40 F the corresponding pressure of water is 0.12164 psi, 0.24767 in. Hg, and 6.2908 mm Hg. For very small pressures, the height of the mercury column is usually measured in the metric system as millimeters of mercury.

In Columns No. 5, 6, 7 and 8 the weight of the saturated vapor is presented in pounds and grains per pound of dry air and also in pounds and grains per cubic foot. In psychrometric calculations pounds or grains per pound or dry air are generally used, while in fan calculations, pounds or grains per cubic foot are used.

The "grain" is a small unit of the

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pound and the equivalent is: 7,000 grains = 1.0 lb.

Refer to the table opposite 72 deg and find in Column No. 4 the figure 0.01697. Because of the difficulty in thinking in terms of such minute fractions of a pound, it is recommended that the figure in Column No. 5 be used. Looking opposite 72 deg in Column No. 5 find 118.78 grains per pound. Figures such as these are far easier to comprehend and handle in calculations. For instance, if one sample of air containing 10 grains per cubic foot or per pound is compared with another sample containing 15 grains, it is easily recognized that the second sample contains 50 per cent more vapor than the first.

Columns No. 7 and 8 are based on 1 cu ft of air, admittedly a mixture of air plus water vapor. The weight of the saturated water vapor is then shown per cubic foot of this mixture.

Columns No. 4 and 5 show the weight of the water vapor on a different basis. The weight of the water is given per pound of dry air. Refer to the table and find opposite 72 F 0.01697 pounds of water and 118.78 grains of water per pound of dry air. It follows that:

Dry Air	= 1.0 pound
Water Vapor	= 0.01697 pound
Mixture	= 1.01697 pounds

Actually, the water vapor and dry air are considered as two separate, distinct gases, even though the molecular mixture is completely intermingled. These two columns show the engineer exactly what weight of water vapor can be mixed with 1 pound of pure dry air to result in a 100 per cent saturated mixture.

If it is necessary to consider 1.0 pound of mixture and you want to find the percentage of dry air and the percentage of water vapor, simple arithmetic is all that is needed. Simply multiply 1 pound by the fraction representing the portion of each substance contained in the sample. The values given in the following examples are also found opposite 72F.

Based on grains per lb:

$$\frac{7000}{7{,}118.78}(1.0) = 0.9833 \text{ lb dry air}$$

Based on pounds per lb:

$$\frac{1000}{1.01697} = 0.9833 \text{ lb dry air}$$

Based on grains per lb:

$$\frac{118.78}{7{,}118.78}(1.0) = 0.0167 \text{ lb water vapor}$$

Based on pounds per lb:

$$\frac{0.01697}{1.01697} = 0.0167 \text{ lb water vapor}$$

The information contained in any one of Columns No. 5, 6, 7 or 8 is called "absolute humidity." Resolved into a definition, absolute humidity is the weight of saturated vapor expressed either per cubic foot of moist air or per pound of dry air.

Observe the tabulation and check the weight of moisture per pound of dry air expressed in grains from the table.

Saturation Temp. Deg F.	Wgt. of Moist. per Lb of Dry Air, Grains
45	45.1815
55	64.603
65	92.82
75	131.74
85	184.94

Probably the best way to explain relative humidity is to present a problem. Assume that a sample of air at 75 F is known to contain 65.87 grains of moisture per pound of dry air. This air can hold 131.74 grains of moisture per pound as can be checked from the table (see Column No. 6). It is customary to refer to "grains of moisture per pound of dry air" as "grains per pound." Relative humidity may then be expressed as the following fraction:

$$\text{Per cent R.H.} = \frac{65.87}{131.74}(100) = 50 \text{ per cent}$$

Expressed in general terms, relative humidity is the ratio of the actual absolute humidity divided by the absolute humidity of saturated air at the temperature being considered.

It is necessary that an understanding of relative humidity be acquired before going on to some of the other psychrometric properties. Two typical examples are presented: The first involves finding the relative humidity of a sample of air; the second involves a problem in practical air conditioning in which the relative humidity is determined for an air conditioned room.

Example: Given air at 85 F and a water vapor pressure of 20.30109 mm of Hg. what is the relative humidity?

Solution: From the Table find the 20.30109 mm of Hg. in Column No. 3. To the right in Column No. 6 it will be found that this represents 120.043 grains per pound of dry air. To the right of 85 F in Column No. 6 saturated air contains 184.94 grains per pound of dry air. Therefore:

$$\text{Per cent R.H.} = \frac{120.043}{184.94}(100) = 64.9 \text{ per cent}$$

(Note: The pounds of moisture per pound of dry air for each case where grains are used will give the same result.)

Example: Air at 48 F, 100 per cent saturated (such air as might have a summer air conditioning air washer). This air is then heated to 78 F and has 26.5 grains of moisture per pound of air added. (As in an air conditioned zone due to moisture from occupants.) What is final relative humidity?

Solution: Opposite 48 F in Column No. 6 find 49.70 grains of moisture for saturated air per pound of dry air.

Absolute Humidity	Grains per Pound
Initial	49.70
Added	26.5
Total of end air	76.20

Since room air at 78 F will hold 146.02 grains per pound if fully saturated as found in Column No. 6, then

$$\text{Per cent R.H.} = \frac{76.20}{146.02}(100) = 52.1 \text{ per cent}$$

We are now ready to investigate the use of the next group of columns under the heading of volume and include Columns No. 9, 10 and 11. All these data are based on a temperature pressure of 14.7 psia, or an absolute pressure of 29.92 in Hg. Column No. 9 shows the volume of 1 lb of bone-dry air. Admitted that this condition is not quite possible, these data, nevertheless, are used in the calculation of partially saturated air volume calculations. Column No. 11 shows the specific volume of 1 lb of saturated mixture or 1 lb of dry air with sufficient additional water vapor to develop a saturated condition. Column No. 10 is the difference between Column No. 9 and 11 and represents the volume caused by the water vapor only.

A simple problem will show plainly how these three columns are used.

Suppose that it is desired to know the volume of 1 cu ft of 72F air at 50 per cent relative humidity. Find the volume of 1 cu ft of bone-dry air at 72 F in Column No. 9. In Column No. 10 find the volume of the moisture vapor which will saturate the dry air at the specific temperature. Multiply this figure found in Column No. 10 by 50 per cent relative humidity reduced to a decimal, add the result to the volume of bone-dry air and the total volume of the partially saturated air is found.

Specific Volume	Cu Ft per Lb
Specific Volume dry air at 72 F ..... =	13.398
Volume added by water vapor (0.364 × 0.50) .. =	0.182
Specific volume of 1 pound of dry air at 72 F plus its partial saturation of 50 per cent ..... =	13.580

Columns No. 12, 13 and 14 show the enthalpy for the specific temperatures of the dry air, the saturated mixture of dry air plus the water vapor to saturate and the difference between the two or the latent heat.

Column No. 12 shows the total heat content of 1 lb of dry air above 0 F. The point on the scale has been selected arbitrarily for convenience only.

(Turn to page 80)

Microfilmed Tables Available Now — They'll Be in Book Form Later

Arrangements have just been completed with Mr. Stevens Rice, University Microfilms, 313 North First St., Ann Arbor, Mich., to make available microfilms of the complete set of tables—44 sheets in all—for a price of $2.50 per set. Orders for these should be directed to the above concern.

The author is also negotiating to have these tables published in book form at a later date. Should you wish to reserve a copy of the book please address all inquiries to Byron Engelbach, 183 Marlborough St., Boston 16, Mass.

The table extending across these two pages consists of excerpted portions of the 44 pages of tables made up by the author to

Thermodynamic Properties of Moist Air

FAHR. TEMP.	PRESSURE AT SATURATION			HUMIDITY RATIO				VOLUME		
				Per Pound of Air		Per Cu Ft of Air		Cubic Feet per Pound		
	inches Hg	mm Hg	lb/sq in	pounds	grains	pounds	grains	Dry Air	Moisture	Saturated
t(F)	P_{s1}	P_{s2}	P_{s3}	W_{s1}	W_{s2}	W_{s3}	W_{s4}	V_a	V_{as}	V_s
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
0.0	**0.037645**	**0.9572**	**0.01849**	**0.0007872**	**5.5104**	**0.00006745**	**0.47215**	**11.578**	**0.015**	**11.593**
40.0	**0.24767**	**6.2908**	**0.12164**	**0.005213**	**36.491**	**0.0004106**	**2.8742**	**12.590**	**0.105**	**12.695**
40.1	.248651	6.31572	.122122	.0052338	36.6366	.00041214	2.88498	12.5926	.1054	12.698
40.2	.249632	6.34064	.122604	.0052546	36.7822	.00041368	2.89576	12.5952	.1058	12.701
40.3	.250613	6.36556	.123086	.0052754	36.9278	.00041522	2.90654	12.5978	.1062	12.704
45.0	**0.30023**	**7.6258**	**0.14746**	**0.006331**	**44.317**	**0.0004928**	**3.4496**	**12.717**	**0.129**	**12.846**
45.1	.301392	7.65532	.148031	.0063557	44.4899	.00049461	3.46227	12.7195	.1295	12.849
45.2	.302554	7.68484	.148602	.0063814	44.6629	.00049642	3.47494	12.7220	.1300	12.852
45.3	.303716	7.71436	.149173	.0064051	44.8357	.00049823	3.48761	12.7245	.1305	12.855
48.0	**0.33629**	**8.5418**	**0.16517**	**0.007100**	**49.70**	**0.0005488**	**3.8416**	**12.792**	**0.146**	**12.938**
48.1	.337574	8.5742	.165801	.0071274	49.8918	.00055078	3.85546	12.7946	.1465	12.9411
48.2	.338858	8.6066	.166432	.0071548	50.0836	.00055276	3.86932	12.7972	.1470	12.9442
48.3	.340142	8.6390	.167063	.0071822	50.2754	.00055474	3.88318	12.7998	.1475	12.9473
55.0	**0.43565**	**11.0655**	**0.21397**	**0.009229**	**64.603**	**0.0007012**	**4.9084**	**12.970**	**0.192**	**13.162**
55.1	.437261	11.10642	.214761	.0092636	64.8452	.00070365	4.92555	12.9725	.1928	13.1653
55.2	.438872	11.14734	.215552	.0092982	65.0874	.00070610	4.94270	12.9750	.1936	13.1686
55.3	.440483	11.18826	.216343	.0093328	65.3296	.00070855	4.95985	12.9775	.1944	13.1719
65.0	**0.62209**	**15.8011**	**0.30554**	**0.01326**	**92.82**	**0.0009820**	**6.8740**	**13.222**	**0.282**	**13.504**
65.1	.624292	15.85703	.306622	.013308	93.156	.0009853	6.8971	13.2245	.283	13.5075
65.2	.626494	15.91296	.307704	.013356	93.492	.0009886	6.9202	13.2270	.284	13.5110
65.3	.628696	15.96889	.308786	.013404	93.828	.0009919	6.9433	13.2295	.285	13.5145
70.0	**0.73915**	**18.7744**	**0.36304**	**0.01582**	**110.74**	**0.001156**	**8.092**	**13.348**	**0.339**	**13.687**
70.1	.74171	18.83943	.364297	.015877	111.139	.0011598	8.1186	13.3505	.3402	13.6907
70.2	.74427	18.90446	.365554	.015934	111.538	.0011636	8.1452	13.3530	.3414	13.6944
70.3	.74683	18.96949	.366811	.015991	111.937	.0011674	8.1718	13.3555	.3426	13.6981
72.0	**0.79112**	**20.004**	**0.38856**	**0.01697**	**118.78**	**0.001233**	**8.631**	**13.398**	**0.364**	**13.762**
72.1	.793836	20.16303	.389894	.01703	119.201	.001237	8.659	13.4006	.3653	13.7659
72.2	.796552	20.23206	.391228	.01709	119.622	.001241	8.687	13.4032	.3666	13.7698
72.3	.799268	20.30109	.392562	.01715	120.043	.001245	8.715	13.4058	.3679	13.7737
75.0	**0.87504**	**22.2228**	**0.42979**	**0.01882**	**131.74**	**0.001356**	**9.492**	**13.474**	**0.407**	**13.881**
75.1	.878006	22.29846	.431246	.018886	132.202	.0013603	9.5221	13.4765	.4085	13.885
75.2	**.880972**	**22.37412**	**.432702**	**.018952**	**132.664**	**.0013646**	**9.5522**	**13.4790**	**.4100**	**13.889**
75.3	.883938	22.44978	.434158	.019018	133.126	.0013689	9.5823	13.4815	.4115	13.893
82.0	**1.1017**	**27.9832**	**0.54112**	**0.02389**	**167.23**	**0.001685**	**11.7950**	**13.651**	**0.523**	**14.174**
82.1	1.10532	28.07515	.54290	.023972	167.804	.0016903	11.8321	13.6535	.5249	14.1784
82.2	1.10894	28.16710	.54468	.024054	168.378	.0016956	11.8692	13.6560	.5268	14.1828
82.3	1.11256	28.25905	.54646	.024136	168.952	.0017009	11.9063	13.6585	.5287	14.1872
85.0	**1.2135**	**30.8229**	**0.59604**	**0.02642**	**184.94**	**0.001847**	**12.929**	**13.727**	**0.581**	**14.308**
85.1	1.21744	30.92298	.597976	.026509	185.563	.0018526	12.9682	13.7295	.5831	14.3126
85.2	1.22138	31.02306	.599912	.026598	186.186	.0018582	13.0074	13.7320	.5852	14.3172
85.3	1.22532	31.12314	.601848	.026687	186.809	.0018638	13.0466	13.7345	.5873	14.3218
90.0	**1.4219**	**36.11626**	**0.69838**	**0.03118**	**218.26**	**0.002144**	**15.008**	**13.853**	**0.692**	**14.545**
90.1	1.42642	36.23101	.700601	.031285	218.995	.0021504	15.0527	13.8556	.6944	14.5500
90.2	1.43094	36.34582	.702822	.031398	219.730	.0021568	15.0974	13.8582	.6968	14.5550
90.3	1.43546	36.46063	.705043	.031495	220.465	.0021632	15.1421	13.8608	.6992	14.5600
92.0	**1.5135**	**38.4429**	**0.74340**	**0.03330**	**233.10**	**0.002274**	**15.918**	**13.904**	**0.741**	**14.645**
92.1	1.51827	38.56406	.745744	.033411	233.877	.0022807	15.9649	13.9065	.7437	14.6502
92.2	1.52304	38.68522	.748088	.033522	234.654	.0022874	16.0118	13.9090	.7464	14.6554
92.3	1.52781	38.80638	.750432	.033633	235.431	.0022941	16.0587	13.9115	.7491	14.6606

cover range from zero to 200 F in tenths of degrees. These particular portions were chosen because they are referred to in article

Standard Atmospheric Pressure, 29.921 in. Hg.

ENTHALPY			ENTROPY			CONDENSED WATER		FAHR. TEMP.
Btu's per Cubic Foot of Dry Air			Btu per °F per lb of Dry Air			Enthalpy	Entropy	
Dry Air	Moisture	Saturated	Dry Air	Moisture	Saturated	Btu/lb	Btu/(lb)/(°F)	
h_a	h_{aa}	h_s	s_a	s_{aa}	s_s	h_w	s_w	t(F)
Col. 12	Col. 13	Col. 14	Col. 15	Col. 16	Col. 17	Col. 18	Col. 19	Col. 20
0.000	0.835	0.835	0.00000	0.00192	0.00192	−158.930	−.3244	0.0
9.608	5.622	15.230	0.02005	0.01183	0.03188	8.09	0.0162	40.0
9.632	5.6447	15.2767	.020098	.011875	.031973	8.19	.0164	40.1
9.656	5.6674	15.3234	.020146	.011920	.032066	8.29	.0166	40.2
9.680	5.6901	15.3701	.020194	.011965	.032159	8.39	.0168	40.3
10.809	6.841	17.650	0.02245	0.01425	0.0367	13.1	0.0262	45.0
10.8330	6.8681	17.7011	.022498	.014303	.036801	13.2	.0264	45.1
10.8570	6.8952	17.7522	.022546	.014356	.036902	13.3	.0266	45.2
10.881	6.9223	17.8033	.022594	.014409	.037003	13.4	.0268	45.3
11.530	7.681	19.211	0.02387	0.01591	0.03978	16.11	0.0321	48.0
11.554	7.711	19.265	.023917	.015969	.039886	16.21	.0323	48.1
11.578	7.741	19.319	.023964	.016028	.039992	16.31	.0325	48.2
11.602	7.771	19.373	.024011	.016087	.040098	16.41	.0327	48.3
13.211	10.009	23.22	0.02716	0.02047	0.04763	23.12	0.0459	55.0
13.2351	10.0469	23.282	.027206	.020544	.04775	23.22	.04609	55.1
13.2592	10.0848	23.344	.027252	.020618	.04787	23.32	.04628	55.2
13.2833	10.1227	23.406	.027298	.020692	.04799	23.42	.04647	55.3
15.614	14.446	30.06	0.03177	0.02901	0.06078	33.11	0.0651	65.0
15.6381	14.4989	30.137	.031816	.029111	.060927	33.21	.06529	65.1
15.6622	14.5518	30.214	.031862	.029212	.061074	33.31	.06548	65.2
15.6863	14.6047	30.291	.031908	.029313	.061221	33.41	.06567	65.3
16.816	17.274	34.09	0.03405	0.03437	0.068420	38.11	0.07460	70.0
16.840	17.336	34.176	.034095	.034487	.068582	38.21	.07479	70.1
16.864	17.398	34.262	.034140	.034604	.068744	38.31	.07498	70.2
16.888	17.460	34.348	.034185	.034721	.068906	38.41	.07517	70.3
17.297	18.533	35.83	0.034950	0.03675	0.07170	40.11	0.0784	72.0
17.321	18.600	35.921	.034995	.036875	.071870	40.21	.07859	72.1
17.345	18.667	36.012	.035040	.037000	.07204	40.31	.07878	72.2
17.369	18.734	36.103	.035085	.037125	.07221	40.41	.07897	72.3
18.018	20.592	38.61	0.036300	0.040600	0.07690	43.1	0.08400	75.0
18.0421	20.6639	38.706	.036345	.040737	.077082	43.2	.08419	75.1
18.0662	**20.7358**	**38.802**	**.036390**	**.040874**	**.077264**	**43.3**	**.08438**	**75.2**
18.0903	20.8077	38.898	.036435	.041011	.077446	43.4	.08457	75.3
19.702	26.198	45.90	0.03943	0.051050	0.090480	50.09	0.0970	82.0
19.726	26.288	46.014	.039474	.051218	.090692	50.19	.09719	82.1
19.750	26.378	46.128	.039518	.051386	.090904	50.29	.09738	82.2
19.774	26.468	46.242	.039562	.051554	.091116	50.39	.09757	82.3
20.423	29.007	49.43	0.040750	0.05624	0.09699	53.09	0.10250	85.0
20.447	29.106	49.553	.040794	.056423	.097217	53.189	.10268	85.1
20.471	29.205	49.676	.040838	.056606	.097444	53.288	.10286	85.2
20.495	29.304	49.799	.040882	.056789	.097671	53.387	.10304	85.3
21.625	34.305	55.93	0.042950	0.065960	0.108910	58.08	0.1116	90.0
21.649	34.421	56.070	.042994	.066171	.109165	58.179	.11179	90.1
21.673	34.537	56.21	.043038	.066382	.109420	58.278	.11198	90.2
21.697	34.653	56.35	.043082	.066593	.109675	58.377	.11217	90.3
22.106	36.674	58.78	0.043820	0.070250	0.114070	60.07	0.1153	92.0
22.130	36.797	58.927	.043864	.070474	.114338	60.17	.11548	92.1
22.154	36.920	59.074	.043908	.070698	.114606	60.27	.11566	92.2
22.178	37.043	59.221	.043952	.070922	.114874	60.37	.11584	92.3

(Continued from page 77)

Column No. 12 shows the sensible heat necessary to raise 1 lb of dry air from 0 F to each particular temperature shown.

Column No. 14 shows the heat content of 1 lb of dry air plus the heat content of the water vapor required to bring about saturation for each specific temperature.

Column No. 13 is a very important column in psychrometric problems. This shows the latent heat of the water vapor. It is this latent heat which is used to calculate the total heat of a partially saturated sample of air. Assume 1 lb of 72 F, 50 per cent saturated air and find the total heat of this air. Opposite 72 F in Column No. 1 find 17.297 Btu per pound in Column No. 12. Find also the latent heat of the water vapor to saturate the dry air in Column No. 13 for the same temperature. Take 50 per cent of this amount and add to the sensible heat. The sum is the total heat of the partially saturated air.

Sensible heat of 1 pound of dry air at 72 F.... =	17.297
Latent heat of water vapor (0.50 × 18.533). =	9.2665
Total heat of 1 lb of 50 per cent saturated air at 72 F. ..... =	26.5635

The "Wet Bulb Temperature" is perhaps one of the most important psychrometric properties. Ordinary temperature is measured in the shade by means of an ordinary thermometer and is referred to as "Dry Bulb Temperature" and is used to determine the sensible heat of the air and is also the base from which all psychrometric data are figured. Since we know that all air has a certain percentage of moisture present and since the quantity of moisture vapor present is of extreme importance, it is imperative that some simple means of determining this quantity be available to the engineer. The wet bulb temperature will give this quantity quickly and easily with the help of the psychrometric tables.

The wet bulb temperature of air is measured by means of a thermometer with its bulb enclosed in a cloth mesh bag or sleeve. The bag must be moistened with clean water, preferably with distilled water (care should be taken to keep the bag always clean and free of other matter or false readings will result), and the air to be measured must be passed over the wetted mesh sleeve until the temperature arrives at a steady value. The theory behind this is quite simple. The evaporation of water from the sleeve takes place because the air, into which the moisture is evaporating, is not at complete saturation, which means that the water vapor originally in the air is superheated. In this particular case the vapor pressure corresponding to the specific temperature is higher than the vapor pressure of the air. There is a natural tendency for these vapor pressures to arrive at equilibrium thereby causing a normal vaporization of the water on the sleeve.

Let us suppose that we have a sample of air whose dry bulb temperature is known and we also know that the relative humidity is 50 per cent. We wish to know what the dew point of this air will be, or in other words, we want to know to what temperature the

dry bulb temperature of this air can be reduced before moisture will condense out of it.

Referring to the table and opposite the original dry bulb temperature we find in Column No. 5 or 6, the pounds of moisture or grains of moisture at saturation. Taking 50 per cent of this amount we find in the same column an identical reading of moisture. Opposite this reading in Column No. 1 we find the saturation temperature corresponding to this moisture content. This temperature is the dew point temperature we are looking for. It should be noted that the same results may be obtained by using the medium of vapor pressure.

Without lengthy preamble on wet bulb the following statements may be accepted as being sufficiently accurate as to permit an oversight of the slight inaccuracies. If further interest prompts the reader, the information is readily available in published papers, information regarding which may be had from the American Society of Heating and Ventilating Engineers.

1. The wet bulb temperatures of different air samples are the same when the total heat is the same, regardless of the proportions of this total heat due to sensible heat of the dry air and latent heat of the water vapor.

2. Regardless of the dry bulb temperature and relative humidity of samples of air, the wet bulb temperature is the same when the total heat is the same.

3. For fully saturated air, the dry bulb temperature and wet bulb temperature and the dew point temperature are the same.

4. Regardless of the dry bulb temperature of air, the absolute humidity or moisture content of the air will be found opposite the dew point temperature.

It is important that the plant engineer remember that the psychrometric tables are based upon 100 per cent saturated air. For fully saturated air, the dry bulb temperature, the wet bulb temperature and the dew point temperature are the same. It has been shown that air at a specific dew point has its absolute humidity (moisture content) opposite the same temperature in Column No. 1 of the tables, regard-

Explanation of Letter Symbols Used in Table

Column No. 1 t(F) Temperature expressed in Fahrenheit degrees.

Column No. 2 p_{s1} Saturation pressure of pure water vapor expressed in inches of mercury.

Column No. 3 p_{s2} Saturation pressure of pure water vapor expressed in millimeters of mercury.

Column No. 4 p_{s3} Saturation pressure of pure water vapor expressed in pounds per square inch.

Column No. 5 W_{s1} Humidity ratio (weight of saturated vapor) of pure water vapor expressed in pounds per pound of dry air.

Column No. 6 W_{s2} Humidity ratio (weight of saturated vapor) of pure water vapor expressed in grains per pound of dry air.

Column No. 7 W_{s3} Humidity ratio (weight of saturated vapor) of pure water vapor expressed in pounds per cubic foot of dry air.

Column No. 8 W_{s4} Humidity ratio (weight of saturated vapor) of pure water vapor expressed in grains per cubic foot of dry air.

Column No. 9 V_s Specific volume of dry air expressed in cubic feet per pound.

Column No. 10 V_{ss} The difference between one pound of dry air plus the moisture vapor at saturation and one pound of dry air or the volume of sufficient water vapor to saturate one pound of dry air.

Column No. 11 V_s Specific volume of one pound of dry air mixed with sufficient additional water in a gaseous state resulting in a saturated mixture, expressed in cubic feet per pound of dry air.

Column No. 12 h_s Specific enthalpy or sensible heat of dry air expressed in Btu per pound.

Column No. 13 h_{ss} The latent heat or difference between the enthalpy or total heat of one pound of dry air plus the moisture required for complete saturation and enthalpy or sensible heat of one pound of dry air, expressed in Btu per pound of dry air.

Column No. 14 h_s The enthalpy or total heat of moist air at saturation per pound of dry air expressed in Btu per pound.

Column No. 15 S_s Specific entropy of dry air expressed in Btu per pound. (Fahrenheit degree, absolute)

Column No. 16 S_{ss} The difference between the entropy of moist air at complete saturation per pound of dry air, and the specific entropy of the dry air itself, expressed in Btu per pound of dry air. (Fahrenheit degree, absolute).

Column No. 17 S_s Entropy of moist air at complete saturation per pound of dry air, expressed in Btu per pound of dry air. (Fahrenheit degree, absolute).

Column No. 18 h_w Specific enthalpy of condensed water (liquid or solid) at standard pressure, expressed in Btu per pound of water.

Column No. 19 S_w Specific entropy of condensed water (liquid or solid) at standard atmospheric pressure, expressed in Btu per pound of water. (Fahrenheit degree, absolute).

less of the dry bulb temperature of the air.

The latent heat of the air will also indicate the dew point temperature. Either the latent heat, dew point temperature or absolute humidity indicates the vapor pressure and it will be found in the table directly opposite either reading. When the wet bulb temperature is known, regardless of the dry bulb reading, the total heat content found in the table opposite the reading will always be the same. Or, stated differently, if the total heat of a sample of air is known, then the wet bulb can be found opposite this reading in Column No. 1.

When the plant engineer knows these few facts the use of the tables becomes an easy matter and practically any problem in psychrometrics may be solved.

Even though the tables present data for fully saturated air, many properties of partially saturated air may be read directly with no additional calculation or by using simple ratios accurate results may be arrived at.

The plant engineer will note that there are four columns included in the table dealing with entropy, namely Columns No. 15, No. 16 and No. 17 and No. 19. Columns No. 15, No. 16 and No. 17 give the entropy, Btu per (deg F) (lb dry air), for dry air, (Col. No. 15); saturated air (Col. No. 17) and the difference or moisture vapor (Col. No. 16). Column No. 19 shows the entropy of condensed water either liquid or solid. They have been included in the table to insure complete psychrometric data. However, they are used infrequently in the solution of problems in which the plant engineer will find himself involved.

Column No. 18 indicating the enthalpy (Btu/lb) for condensed water either liquid or solid is used more frequently and the use will be demonstrated later in a specific problem.

Typical Examples Using the Tables for Their Solution

Example No. 1: Find the wet bulb temperature of moist air at 90F, and 50 per cent relative humidity, atmospheric pressure.

Solution: The total heat reflects the wet bulb temperature. Therefore Find:

Sensible heat 90F air = 21.625 Btu (Col. No. 12 opposite 90 deg. in Col. No. 1)

Latent heat 90F sat. air = 34.305 Btu (Col. No. 13 opposite 90 deg in Col. No. 1)

Actual latent heat of air = 17.1525 Btu = (0.50 × 34.305)

Sensible heat plus actual latent heat = total heat

21.625 + 17.1525 = 38.7775 Btu total heat

Find: Wet bulb temp. 75.2F (approx.) (Locate 38.7775 in Col. No. 14 and read wet bulb temp. opposite in Col. No. 1)

Example No. 2: Find the relative humidity of moist air at 92F dry bulb temperature and 65F wet bulb temperature, atmospheric pressure.

Solution:

Find:

Total heat 65F air out = 30.064 Btu (Col. No. 14 opposite 65F Col. No. 1)

Sensible heat 92F air = 22.106 Btu (Col. No. 12 opposite 92F Col. No. 1)

Actual latent heat = total heat minus sensible heat

Therefore:

30.064 minus 22.106 = 7.958 Btu = latent heat

Latent heat 92F saturated air = 36.674 Btu (Col. No. 13 opposite 92F Col. No. 1)

Therefore:

7.958 ÷ 36.674 (100) = 21.7 per cent relative humidity (approx.)

Example No. 3: What is the dew point temperature of moist air at 82F, 50 per cent relative humidity, atmospheric pressure?

Solution:

Find: Humidity ratio 82F sat. = 167.23 gr. per lb. (Col. No. 6 opposite 82F Col. No. 1)

Actual humidity ratio = 83.665 gr. per lb. (0.50 × 167.23)

Locate 83.665 gr. per lb. in Col. No. 6 and read dew point in Col. No. 1 of approximately 62.1F.

Example No. 4: What is the relative humidity of moist air at 92F dry bulb temperature and 40F dew point temperature, atmospheric air?

Solution:

Find: Humidity ratio of 40F sat. air = 36.491 gr. per lb. (Col. No. 6 opposite 40F Col. No. 1)

Humidity ratio of 92F sat. air = 233.1 gr. per lb. (Col. No. 6 opposite 40F Col. No. 1)

Therefore:

36.491 ÷ 233.1 (100) = 15.7 per cent relative humidity

Example No. 5: Write down all the properties of moist air at 90F dry bulb and 70F wet bulb temperature.

	Known	*Found*
Dry Bulb	90F	
Wet Bulb	70F	
Dew Point		60.7
Relative Humidity		85.17 gr. per lb.
Humidity Ratio		36.35 per cent
Sensible Heat		21.625 Btu per lb.
Latent Heat		12.465 Btu per lb.
Total Heat		34.09 Btu per lb.
Vol. Dry Air		13.853 Cu. ft. per lb.
Vol. Moisture		0.251 Cu. ft. per lb.
Vol. of Mixture		14.104 Cu. ft. per lb.
Vapor Pressure		13.58405

Solution:

Find:

1. Sensible heat 90F air = 21.625 Btu (Col. No. 11 opposite 90F Col. No. 1)
2. Total heat 70F sat. air = 34.09 Btu (Col. No. 13 opposite 70F Col. No. 1)
3. Actual latent heat = Total heat minus sensible heat 34.09 minus 21.625 = 12.465
4. Latent heat 90F sat. air = 34.305 Btu (Col. No. 12 opposite 90F Col. No. 1)
   Actual Latent Heat 90F air = 12.465 Btu (see step No. 3)
   Per cent R. H. = 12.465 ÷ 34.305 (100) = 36.35 per cent
5. Humidity ratio 90F sat. air = 218.26 gr. per lb (Col. No. 6 opposite 90F Col. No. 1)
   Actual humidity ratio = 79.5 gr. per lb. = (0.3635 × 218.26)
6. Dew point = 60.7F (opp. 79.5 gr. per lb in Col. No. 6 read dew point in Col. No. 1)
7. Vol. dry air 90F = 13.853 cu ft per lb (Col. No. 8 opposite 90F Col. No. 1)
8. Vol. moist. to sat. 90F = 0.692 cu ft per lb (Col. No. 9 opposite 90F Col. No. 1)
   Act. vol. moist. 90F = 0.251 cu. ft per lb (0.3635 × 0.692)
9. Total volume = 14.104 cu ft per lb (13.853 + .251)
10. Vapor Pressure = 13.58405 mm Hg. (Col. No. 3 opposite 60.7F in Col. No. 1)

A close observation of the examples and solutions presented will give the plant engineer a sufficient understanding of the use of the table so that for general purposes he may select adequate equipment. However, if it is desired to find more accurate solutions by the use of the table, then it is advised that the engineer study the Heating, Ventilating, Air Conditioning Guide as published by the American Society of Heating and Ventilating Engineers, 51 Madison Avenue, New York 10, N. Y. The formulae used in this publication are more complicated and give accurate results, where the formulae and methods used in this article are so-called short cut methods sufficiently accurate for most purposes and are presented for practical application.

For instance, refer to Example No. 1. It should be noted that the heat of the condensed liquid has been neglected in the solution. Using the ASHVE Guide method of solution, the heat of the condensed liquid as found in Column No. 18 in a fixed formula, the solution to the problem is as follows:

At 90F with 50 per cent relative humidity:

Total moisture = 0.03118 lb per lb of air (Col. No. 5 opp. 90F in Col. No. 1)

Actual moisture = 0.01559 lb per lb of air (0.50 × 0.03118)

Sensible heat = 21.625 Btu per lb (Col. No. 12 opp. 90F in Col. No. 1)

Latent heat = 17.155 Btu per lb (0.50 × 34.31 Btu found in Col. No. 13 opp. 90F in Col. No. 1)

Total heat = 38.780 Btu per lb (Add sensible and act. latent heat)

Locate the approximate wet bulb opposite 38.78 in Col. No. 14 in Col. No. 1 and find 75.2F.

Humidity ratio of 75.2F = 0.018952

lb per lb (Col. No. 5 opp. 75.2F in Col. No. 1)

Specific enthalpy of liquid = 43.3 Btu (Col. No. 18 opp. 75.2F in Col. No. 1). Therefore total heat = 38.78 + 0.018952 — 0.01559) × 43.3 = 38.8256 Btu. Opposite 38.8256 located in Col. No. 14 find in Col. No. 1 the wet bulb reading which is 75.25F approximately.

It should be noted that there is a difference of 0.005F in the wet bulb calculations.

The use of entropy figures shown in the table is intentionally omitted since it is believed that confusion would result. The author's intent is to simplify for the plant engineer the solution of his common air conditioning problems. Constant use of the table will result in the rapid finding of desired facts and the elimination of many of the steps as shown in the problems. Only those facts directly pertaining to a problem need to be worked out and the necessary steps can only be determined by practice. In the problems all the facts were solved for, and in the final analysis many were not needed. However, it was felt that a complete solution would assist in applying solutions to problems not possible to cover.

Psychrometric Definitions of Terms Used in These Tables

PRIOR TO A STUDY and analysis of the psychrometric table the commonly used terms need brief explanations. To simplify further discussions, air plus whatever amount of water vapor is mixed with it will be referred to as a single word, namely "air." The dry portion only of the mixture will be referred to as "dry air."

1. Density is a unit volume of air measured in pounds per cubic foot under specified conditions.

2. Specific Volume is the reciprocal of density and is the volume occupied by the unit weight of air under specified conditions of temperature and pressure and measured in cubic feet per pound.

3. Pressure. Air has appreciable density and constantly exerts an atmospheric pressure, "barometric pressure," at sea level of 29.921 inches of mercury, or 14.7 psi, or, expressed differently, is equal to a column of water 34 ft high. As the altitude above sea level increases this pressure decreases at an approximate rate of ½ lb per sq in. per 1000 ft of rise for the first mile in height.

4. Gauge Pressure is the pressure measured above atmospheric pressure as a base expressed in pounds per square inch.

5. Absolute Pressure is the sum of the gauge pressure and barometric pressure, or the total pressure above a perfect vacuum, expressed in pounds per square inch.

6. Vacuum is the pressure measured below atmospheric base expressed in inches of mercury (in. Hg).

7. Temperature is defined as the measure of molecular activity.

8. Dry Bulb Temperature is that temperature of air as measured on a conventional thermometer scaled in degrees Fahrenheit (F) degrees Centigrade (C).

9. Absolute Temperature is obtained by adding 459 deg to the Fahrenheit temperature or 273 deg to the Centigrade temperature.

10. Laws of Gases:

1. At a constant temperature the volume varies inversely as the absolute pressure (Boyle's Law).

2. At a constant pressure the volume varies directly as the absolute temperature (Charles' Law).

3. At a constant volume the pressure varies directly as the absolute temperature (Charles' Law).

Combining the above laws, the following is accepted: $PV = KT$

where P = Absolute Pressure, psi; V = Volume, cu ft per lb; K = a constant (for air 0.370); T = absolute temperature, deg F.

Air at atmospheric pressure of 29.92 in. Hg, 68 F and 50 per cent relative humidity and having a density of approximately 0.075 lb per cu ft is generally accepted for fan-rating table performances.

11. Heat is a form of physical energy existing within a substance because of molecular activity. There are several forms of energy and each is mutually convertible under energy conservation laws.

12. Btu (British Thermal Unit) is the heat required to raise 1 lb of water 1 deg F.

13. Calorie is the French thermal unit and represents the heat required to raise one kilogram of water 1 deg Centigrade.

14. Foot Pound is the mechanical energy required to raise a 1 lb weight 1 ft vertically against gravity and expressed in heat equivalent, 778 ft lb equals 1 Btu.

15. Specific Heat is defined as the number of Btu required to raise the temperature of 1 pound of substance 1 deg F or the number of calories required to raise 1 kg 1 deg C. Water, the standard unit, has a specific heat of 1.0.

16. Sensible Heat is the heat represented by a change of dry bulb temperature either added to or subtracted from a substance. In psychrometry Sensible Heat refers to the Btu content of dry air.

17. Latent Heat of Fusion. To change the physical state of a substance requires an appreciable amount of heat. Changing the physical state means a change from a solid to a liquid. To raise a 1 lb block of ice from 0 deg to 32 deg F under normal atmospheric conditions of 29.92 in. of mercury requires approximately 15.4 Btu since the specific heat of ice is 0.48. Prior to raising the temperature to a higher point the ice at 32 deg F must be melted. The sensible heat will remain at 32 deg F while fusion or a change of state from a solid to a liquid takes place. Approximately 144 Btu must be added to the substance to accomplish this change and this amount is called "the latent heat of fusion of ice."

18. Heat of the Liquid. Still referring to the original 1 lb block of ice, further addition of heat after fusion is completed results in a rise in temperature of the liquid and this heat which is added to reach any given temperature below 212 deg, or the boiling point, is called the "heat of the liquid." The heat of the liquid is determined by multiplying the temperature degree rise times the specific heat of the liquid.

19. Latent Heat of Vaporization. The original block of ice, now water at 212 F, may still be heated to accomplish a second change of state from a liquid to a vapor or "steam" at 212 F. The heat required to accomplish this is the "Latent Heat of Vaporization." To vaporize 1 lb of water requires 970 Btu.

20. Total Heat of Steam. The total heat of steam is the amount of heat required to convert 1 lb of water at 32 F to 1 lb of steam at 212 F and is 180 + 970 = 1150 Btu per pound.

21. Saturated and Superheated Steam. If the process is continued and additional heat is added to the 1 lb of steam which is completely evaporated or in a vaporized state, the temperature will rise and the steam is referred to as "superheated" or "dry saturated."

22. Total Heat is the sum of the latent heat of the water vapor plus the sensible heat of the air mixture.

23. Wet Bulb Temperature or Thermodynamic Wet Bulb Temperature is the temperature at which a liquid (water in this case), by evaporating into surrounding air, can bring the air to saturation.

24. Saturated Air expresses that condition when a given volume of air at a fixed temperature contains the maximum amount of water vapor which can exist for the specific temperature.

25. Dew Point is the temperature corresponding to saturation for a given moisture content. If the water vapor present in a given volume of air is less than the saturation level, it is said to be "superheated," since the temperature may be lowered without effecting condensation.

26. Vapor Pressure measured in inches of mercury or the equivalent is the pressure exerted by the water vapor component of the existing atmospheric pressure. Water vapor has a tendency to saturate the surrounding space and exerts a pressure which varies with the density of the vapor.

27. Evaporation. The physical characteristics of evaporation of water is due to opposing molecular forces whose tendencies are to arrive at equilibrium. Whether the rate is slow or rapid depends much on temperature. The atmospheric pressure influences the rate as is shown in the case of water flashing into vapor in a vacuum. With an increase in water vapor in partially saturated air, the vapor pressure will increase until equilibrium is reached between the vapor pressure and the evaporative force at saturation.

28. Humidity refers to moisture or water vapor contained in atmospheric air.

29. Absolute Humidity refers to the weight of water vapor per unit volume (vapor density), regardless of its temperature or whether or not the air is saturated.

30. Relative Humidity implies the degree of saturation or the amount of moisture vapor present within a given space in proportion to the amount required for saturation, expressed as a percentage. This percentage is the ratio between the actual weight of water vapor per cubic foot to the maximum weight of water vapor per cubic foot at saturation at the same temperature.

31. Humidity Ratio is the weight of water vapor per pound of dry air, sometimes called specific humidity, expressed in grains per pound of dry air, or pounds per pound of dry air, occasionally grains per cubic foot or pounds per cubic foot.

Automatic Safety Stopper Keeps Steel Bars in Place

Shop-made safety stopper flips up after material has been stored—and keeps it in place . . . The former method of inserting steel clips, occasionally—due to negligence—resulted in bars rolling off arms, endangering personnel

AUTOMATIC SAFETY stoppers on the ends of the arms of storage racks have now been installed, thanks to a safety suggestion, on racks in all the plants of Joseph T. Ryerson & Son, Inc.

The design of these particular racks originated in the Ryerson Co. and they are used primarily for efficient stocking of large diameter cold finished steel bars and tubing. They could be compared to a series of tree trunks with the branches going out horizontally on each side from a central trunk.

The steel bars are crane-handled to steel cross bridges on the ends of these racks. When using this extension arm, the safety stopper is flipped over in a horizontal position by the stockman and block holds it in place to permit loading or unloading of material from this rack.

In the loading operation the bar is rolled by hand towards the inside of these arms. The extension bridge is then removed and the stopper automatically rotates from a horizontal to a safe vertical position, thus preventing bars from rolling off the rack arms to the floor.

The former method of assuring safety was in the form of a small steel clip which was inserted at the end of the rack arm by the stockman over the flange of the arm to prevent bars from rolling off. This particular method was safe enough as long as the stockman remembered to slip the steel clip over the end of the arm.

In several instances, however, this was neglected and one or two accidents were narrowly averted when stocked bars rolled off the ends of the rack arms.

Some of the Ryerson plants have a large number of these racks. Since the installation of the new type safety stoppers there has not been a single instance of stocked bars rolling off the rack arms.

Girl points to the automatic safety stopper which holds steel bars in place

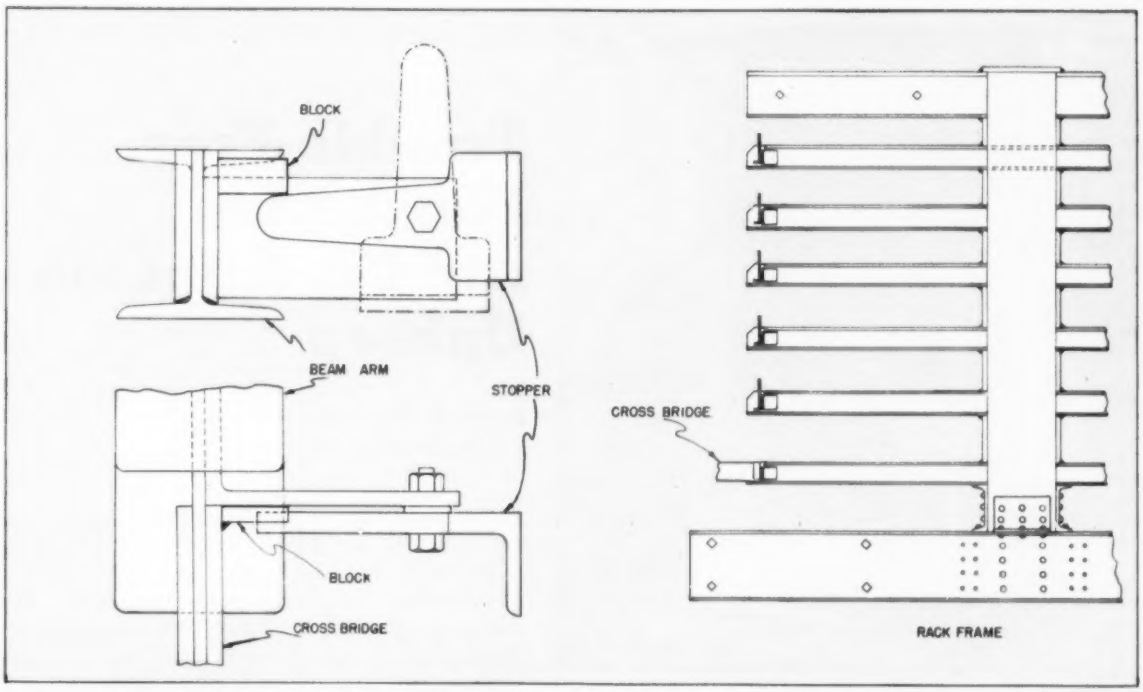


Diagram at top left shows how safety stopper flips from horizontal to vertical when cross bridge with block section is removed. Lower left shows cross bridge inserted with stopper in horizontal position. Portion of cross bridge can be seen attached to special rack frame shown at right. Cross bridge is used to permit loading and unloading of stock

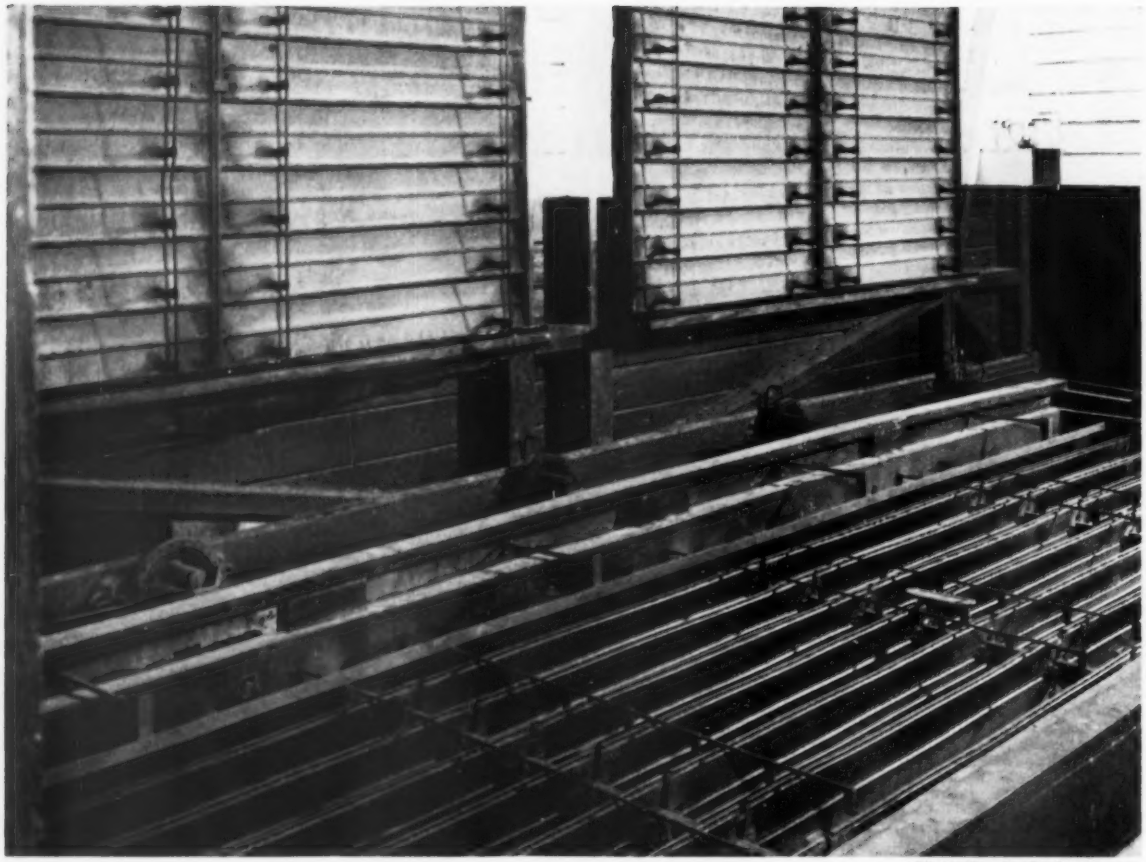


Photo: Hercules Powder Company

Fig. 1. Opposite the wall louvers in the blending room is this heavy metal baffle plate which traps large particles of dirt and grease as air moves to precipitator. Chlorinated rubber base paint is protection against severe conditions encountered

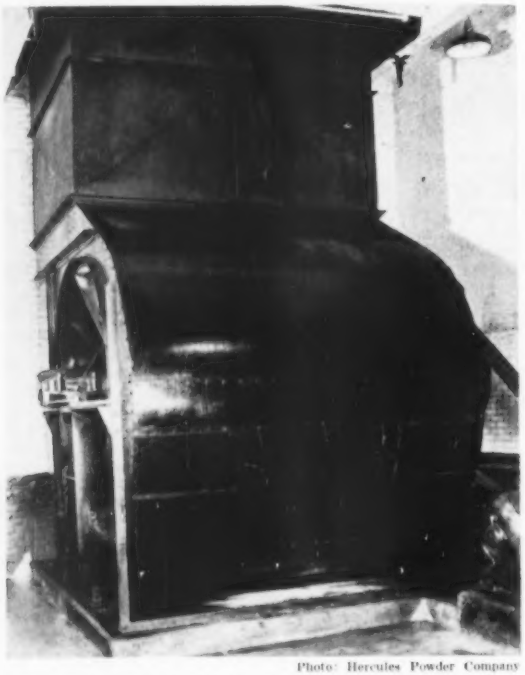


Photo: Hercules Powder Company

Fig. 2. All metal sections of the air-washer unit and fan are cleaned at intervals from 18 to 24 months. Painted same as in the photograph above, there has been no evidence of rust

Trouble-Free Finish Cuts Air Conditioning Upkeep

By W. T. WATSON, Plant Engineer
Judson Mills, Greenville, S. C.

Air conditioning, a necessary piece of equipment for all modern textile mills handling synthetic yarns, has posed many new maintenance problems for plant engineers . . . Need for trouble-free operation makes imperative positive protection against corrosion . . . Here's how one plant engineer solved the problem with use of chlorinated rubber paints

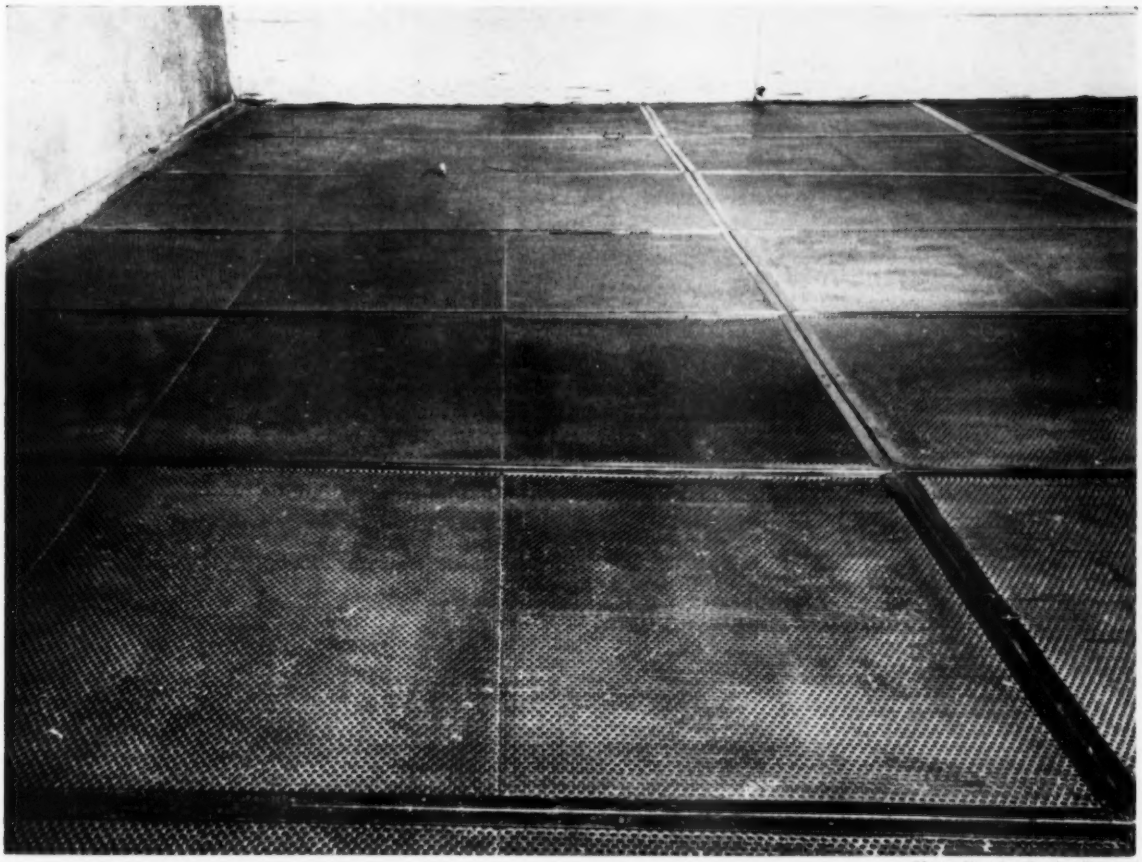


Photo: Hercules Powder Company

Fig. 3. In the blending room the wall and floor louvers are coupled in the thermostatically controlled systems which blends washed air with return air from conditioned areas. Room temperature here is 51 F, while relative humidity is 96 per cent

AS THE AIR-CONDITIONING industry grows by leaps and bounds the corrosion problems of the plant engineer multiply correspondingly. The coatings applied by air-conditioning manufacturers to original equipment give only temporary protection at best. Humidity and condensation immediately set up a corrosive cycle, which if unchecked, can quickly damage or destroy key parts in the installation.

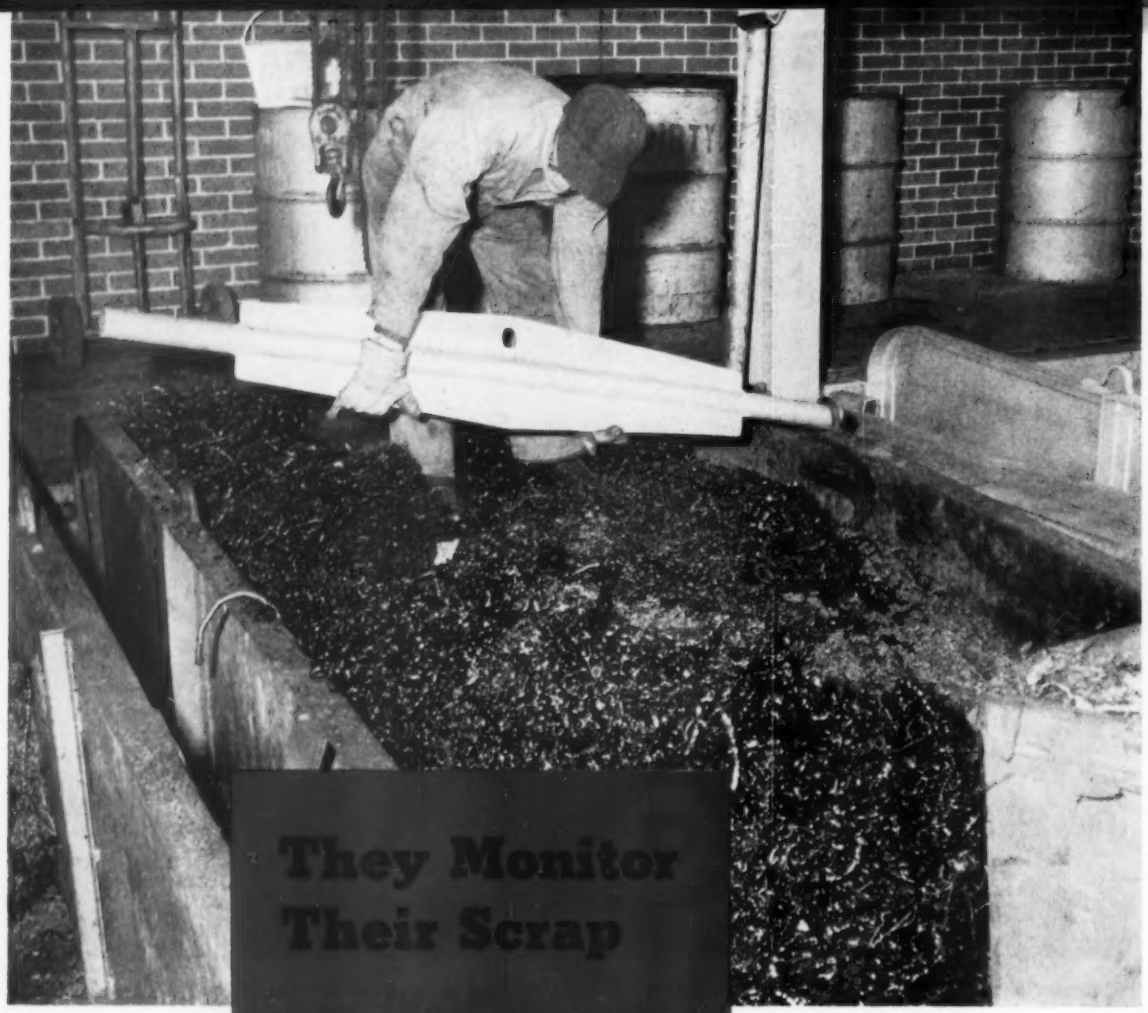
The air-conditioning industry itself has found an answer to many of its corrosion problems in finishes based on chlorinated rubber. Various coatings have been developed for use in protecting the internal parts of conditioning units. But maintenance is almost always the responsibility of the plant engineer, who very often finds himself without any specific recommendations from the manufacturer to guide him.

One of the large textile mills in the south, Judson Mills, has found an excellent solution to air-conditioning corrosion problems in durable, moisture-resistant coatings based on chlorinated rubber. These finishes provide excellent protection for both concrete and metal not only against moisture, but acids and alkalis, mineral oils, mold and algae growths.

Ten years ago, when air-conditioning installations were few and far between our plant, Judson Mills, Greenville, S. C., one of the Deering Milliken Mills, acquired its first evaporative cooling unit. From the very outset exposed metal parts were protected with chlorinated rubber finishes, then painted at regular 18-month intervals. After ten years of continuous use the first fan unit still remains in excellent condition. As additional units have been acquired, the same finish has been applied to fans, baffle plates, and louvers. Today a total of sixteen units, ranging in size from 45,000 cfm to 185,000 cfm served by four refrigeration units with capacity from 600 to 1,200 tons, provide cooling for areas where more than 2,000 workers are employed. Because the Rubalt paint used in maintenance proved to outlast the finishes originally applied by the manufacturer, new equipment is now ordered with only a single coat of primer. After installation, it is painted before being put in use, with the same paint that will be used to maintain it throughout its service life.

Since synthetic yarns are used in over 80 per cent of the mills' weaving, the need for air-conditioning is critical. Shutdowns for cleaning, painting, or repairs are scheduled for week ends entailing overtime pay. For this reason, all equipment is painted immediately after grease and dirt have been removed, regardless of the condition of the existing finish. Quite often there has been no indication of finish failure at clean-up time, but an additional coating nevertheless was applied as a safeguard against future breakdown. No record of actual life expectancy of the coatings is therefore available.

Judson Mills uses Rubalt RA paints on the metalwork in several key points in the installation. In the plenum chamber of the humidifier (or dehumidifier) where a constant temperature of 51 F is maintained, with 96 per cent relative humidity, it protects the thermostatically coupled wall- and floor-louvers which blend fresh air from the washers with return air from the conditioned areas. It is used, too, on the big metal baffle plates which equalize the air flow to electric filters that remove dirt and grease particles as the air moves toward giant fans supplying the plant. The fan units are painted similarly.



They Monitor Their Scrap

Liftable, dock-high, truck-high bins plus segregation, plus oil savings are paying dividends

Fitting removable arm into eyes on bin. Hoist then is dropped down to raise bin

IS YOUR PLANT getting dollar value for its scrap? Maybe you are—but chances are you aren't.

It's a good bet, also, that you don't know the market value—the current going price—for your scrap. An equally good wager puts money on the line that you have no accurate record—your own record—of the tonnage of scrap leaving your plant. What's needed is some shop research, aimed at monitoring your scrap pile.

For more than a year Los Angeles' McCulloch Motors Corp. has been calculating its segregated scrap with eagle eye. As Plant Engineer H. M. Eversz figures it, fully 52 per cent of his department's overhead involves plant clean-up—collecting scrap, tending floors, draining machine oil sumps, etc. The best place to show a profit against this mounting overhead is in the scrap heap.

Until last year, McCulloch, like many another plant, had let a scrap dealer pick up its metallic wastes. It took the dealer's word for tonnages delivered, didn't haggle nor much worry about current market prices. Then, estimating that McCulloch's five Los Angeles plants produced more saleable scrap than met the eye, Mr. Eversz set to monitoring scrap experimentally at the main plant.

Into the same experimental scrap collecting installation, he designed labor-saving devices, calculated to reduce in-plant waste removal costs.

At an approximate cost of $6000, Mr. Eversz built a 92-ft long waste-disposal dock, divided into nine concrete pits. Eight of these (approximately 5-ft wide, 9-ft long) house 1-ton capacity sheet-steel bins which rest on four hinged, but otherwise anchored, legs. The bin area is roughly divided into thirds, each installed with an overhead, 2-ton capacity full-bridge from which hang 2-ton electric hoists. These hoists raise each bin, using a detachable arm. As bins are raised to truck-bed level from their below-dock resting position, they are weighed by a 5000-lb limit, Dillon hook-type weight indicator. When raised to truck-bed level, bins slope slightly truckward, making it easy for scrap dealers to shovel contents into their rigs.

But the important point: McCulloch weighs every bin-load of scrap leaving its plant.

Each bin segregates a definite type of waste: trash, scrap sheet metal, steel chips, scrap steel, magnesium slag, aluminum chips, and aluminum turnings.

Each sheet-steel bin has a drain pipe in its bottom which fits into a pit drain pipe (when in the resting position). This allows oil, soaking various machined chips, to drain into a settling basin beneath the dock. Here, metal chips settle out, while the oil wastes overflow into a sump. Periodically, oil is sucked out and sold. Not even settling basin chips are wasted.

During the first six months of 1952, while this new scrap monitoring system was being tested, McCulloch agreed to let a dealer take all metal scrap at a flat $600 a month. This was approximately the old, going price, arrived at without too much concern over current market prices. However, after weighing each outgoing segregated batch (and checking these figures against the dealer's), McCulloch discovered that scrap could mean higher income if sold by the pound, day-to-day, at current prices.

One advantage of the bin system is that, within limits, McCulloch can wait out the scrap market, sell when the going price is highest. Currently it is operating on a per pound, day-to-day basis, expects increased profits from metal wastes to more than pay for its dock installation within a year or so.

McCulloch hopes to further systematize scrap disposal by drawing up an average six-monthly scrap tonnage, then asking for carry-away bids from various dealers. It believes that it can get a better price than ever before, and for the first time it now knows—almost to the pound—its outgoing scrap volume. Not only does the company now know scrap output in tonnages, but also the breakdown for various types of scrap, some of which are more valuable than others.

From its primary historical data, gathered over the last few months, McCulloch's advice to other plants now selling scrap on a tonnage basis is this: sell all scrap in segregated lots. Sell it type for type, on a per poundage basis. This means that plant maintenance should realize maximum price for every category of scrap.

Sometimes volume can be a fooler. For example, a plant with a ton-a-month output of one type of metal scrap may settle, for convenience, for a flat rate based upon this metal. Yet it may also produce a few hundred pounds of really valuable scrap. This smaller tonnage may be overlooked when actually it may be worth more than the ton of cheaper metal.

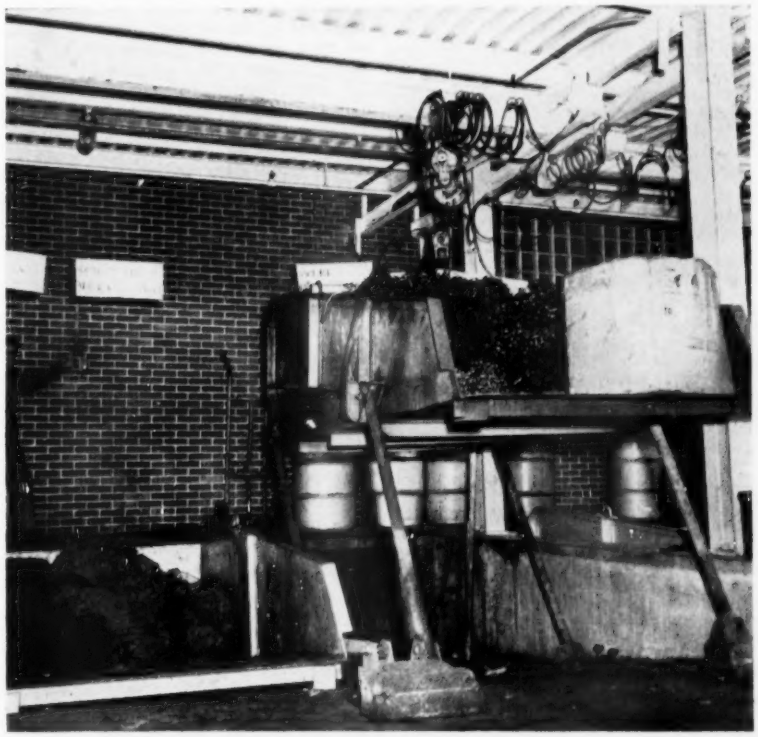
"And you don't have to produce huge quantities of scrap to make it pay its own way," says Plant Engineer Eversz.

McCulloch, with about 2000 employees produces relatively small quantities of saleable scrap: an average 40,000 pounds monthly of aluminum, magnesium and steel. Yet profits, it figures, will pay the cost of its new waste disposal dock within a two year period, perhaps sooner.

Incidentally, dock design actually brought about reduction in scrap collection personnel. Two employees have been transferred to other maintenance jobs simply because bins are installed below dock-level. This allows dumping—which was not possible previously.

In effect, ability to raise bin gives a two-level bin, one truck-high and the other dock-high so that refuse carts may be easily dumped. Hoist, running on monorail, is used to lift bins to truck height for easy emptying. One hoist does the job by means of a monorail above the bins controlled by push-button on the dock

Control of the bins has been made as easy as possible. Here, the maintenance man presses button and up goes the hoist-raised bin, truck-high, ready for emptying. Note how the "leg action" has been made possible by good design of the bin, anchor, and legs. Weight indicator located between hook and hoist



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FLUORESCENT LAMPS— Application Characteristics

The previous article on fluorescent lamps discussed their general characteristics, while this portion covers their application characteristics . . . Such subjects as luminous efficiencies, lamp bases and holders, types of fixtures

By **LEONARD V. JAMES**, Illuminating Engineering Consultant

IN THE FIRST of this series of two articles on fluorescent lamps, which appeared in the February issue of PLANT ENGINEERING, many of the physical characteristics of these lamps were considered. This article will comment on some of the more common lamps and accessories not previously covered. It will also discuss particularly those characteristics which rather definitely influence the use of the lamps for the production of illumination.

Lamp Types and Characteristics

All fluorescent lamps are tubular in shape, which accounts for the "T" in the listing. The number following the "T" indicates eighths of an in. in diameter. Thus T12 is a tubular lamp 1½ in. in diameter. The number before the letter usually carries its own designation when printed, such as 40 watt T12 or 96 in. T12, the words watt and inch frequently being omitted in conversation.

The starting and operating characteristics of both hot and cold cathode lamps were explained in the previous article. As noted there, all of the twenty-odd hot cathode lamps are similar in that they have fine tungsten wire cathodes, coiled and coated with emissive material. This material assists in establishing and maintaining the electronic discharge, in the gas column between the ends of the lamp tube, which discharge is responsible for the high frequency bombardment of the phosphor powder and its emission of light.

In the slimline and the very new "rapid-start" lamps, this cathode wire is "triple coiled" and heavily coated, greatly facilitating starting.

A principal difference between various fluorescent lamps is in their luminous efficiencies. These are expressed in terms of lumens of light output per watt consumed. Lamp manufacturers list these values in their circulars, so far as "nominal" lamp watts are concerned. They will be found to vary, in any one size, for different phosphor combinations (cool white vs. warm white) and also to vary for the different lamp sizes. The table gives these values for the lamp sizes most used in industry.

Plant engineers who are especially interested in these efficiencies will however do well to divide the light output values by the total consumed wattages. This total is the sum of the average watts for the lamp and the watts lost in the particular ballast used, per lamp.

Some engineers will be more interested in the light output per foot of tube, from which relative values of light from equal lengths of tubing or of fixtures can be computed. Others will be concerned with the relative brightness of the lamps, from the standpoint of controlling image reflections in polished materials or in calendered or tracing papers. In many instances, this avoidance of veiling glare or brightness is of great importance.

Economy in the use of fluorescent lamps may be extended to the wiring serving these lamps. Ballasts can be made for operation on almost any distribution voltage, and are available, in some types, for 199-216, 220-250 and 240-280 v, as well as 110-125 v. Energy can thus be distributed at double the customary voltage, with substantial savings either in the wiring losses or in the weight of copper.

Fluorescent lamps are susceptible to ambient or surrounding temperatures even in still air, but more particularly in drafts. It will be noted from Fig. 1 that maximum light output occurs when the ambient temperature is about 80 F. Since the lamp develops some heat, too great enclosure or too close

Table shows data on typical fluorescent lamps often used in industrial lighting

TYPE	40w T12	40w T17	90w T17	72 in. T12	96 in. T12
Nominal watts	40	40	90	55	74
Lamp current	.43	.425	1.57	.425	.425
Nominal length in feet*	4	5	5	6	8
Lamp voltage	99	103	61	145	190
Light output in lumens					
Standard cool white	2350	2350	4850	3400	4950
Standard warm white	2500	2500	5150	3550	5100
Lumens per average watt†					
Standard cool white	60	57	54	62	67
Standard warm white	64	61	58	65	69
Lumens per foot					
Standard cool white	588	470	970	567	619
Standard warm white	625	500	1030	592	638
Brightness in footlamberts‡					
Standard cool white	1800	1050	2150	1750	1800
Standard warm white	1900	1100	2250	1850	1850

* Includes two standard lampholders; longer if turret lampholders are used

† Lamp watts only

‡ A diffuse surface which reflects 100 per cent of the light and is illuminated to one footcandle has a brightness of one footlambert

Acknowledgment is due Benjamin Electric Manufacturing Co., Curtis Lighting, Inc., Day-Brite Lighting, Inc., General Electric Co., Solar Light Manufacturing Co., and F. W. Wakefield Brass Co. for illustrations and other material for this article.

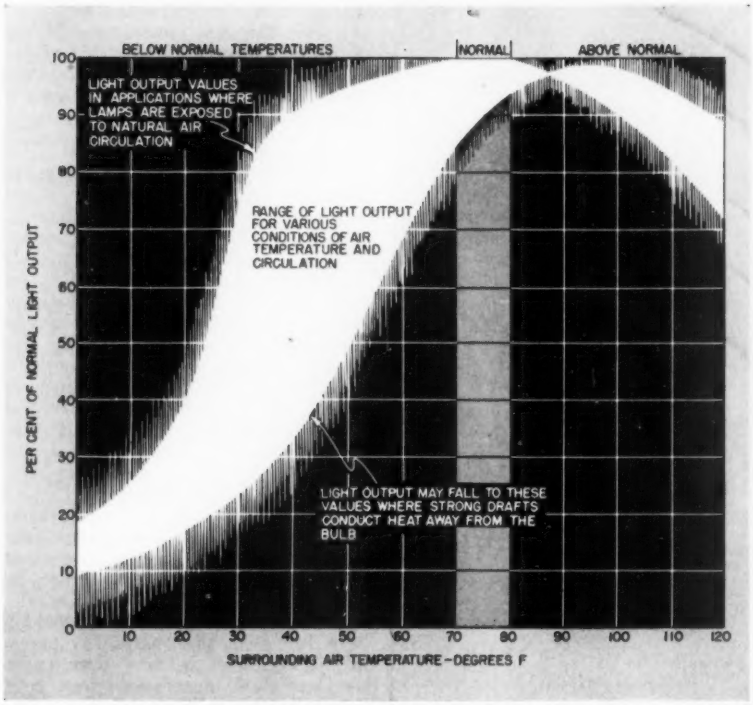

BELOW NORMAL TEMPERATURES
NORMAL
ABOVE NORMAL
LIGHT OUTPUT VALUES IN APPLICATIONS WHERE LAMPS ARE EXPOSED TO NATURAL AIR CIRCULATION
RANGE OF LIGHT OUTPUT FOR VARIOUS CONDITIONS OF AIR TEMPERATURE AND CIRCULATION
LIGHT OUTPUT MAY FALL TO THESE VALUES WHERE STRONG DRAFTS CONDUCT HEAT AWAY FROM THE BULB
PER CENT OF NORMAL LIGHT OUTPUT
SURROUNDING AIR TEMPERATURE—DEGREES F

Fig. 1. Chart shows influence of ambient (surrounding) temperature on light output of fluorescent lamps, when exposed to strong drafts, to natural circulation of air or to intermediate conditions. Lamps operate at maximum luminous efficiency at 70-80 F in natural circulation according to results of research on subject

spacing between lamps may well result in a tube temperature high enough to reduce the lamp efficiency. On the other hand, too great exposure in cold atmospheres will result in a lower temperature than desired and will also reduce the efficiency.

Fortunately, economical lighting practice dictates the use of lamps in suitable reflectors or fixtures. Under such conditions, the lamps can be operated quite satisfactorily in virtually any interior, even in industrial buildings where huge crane doors are opened frequently, whatever the weather. When used out of doors, enclosing the lamps will conserve their heat. Thousands of lamps are in use today, in fact, in enclosing tubes of white glass, at gasoline service stations.

Lamp Bases and Holders

All who have used any fluorescent lamps are familiar with the one or two pins, extending from the bases at the ends of the lamps. All preheat lamps have two pins (bipins) so the cathodes can be connected in series with the starting switch for pre-heating. All single-pin based lamps must operate instant start, without pre-heating. Certain instant start bipin based lamps also start without starters and the two pins are connected together in the lamp base. Bipin based lamps are usually listed according to their nominal watts rating and tube diameter (40w T12, 90w T17, etc.), while slimline single-pin based lamps are listed according to their length and diameter (72 in. T12, 96 in. T12, etc.).

Holders for bipin based lamps are of two general types. In one case, the pins are pushed side-ways into the holder and held there by a spring or by giving the lamp a quarter turn to lock it in place. (See A, Fig. 3). In the other case, the pins at one end of a lamp are inserted into two holes in a "turret" type holder and pushed against a spring in the holder. The pins at the other end can then be inserted into the second holder. (See B, Fig. 3). Such turret type holders are made for from one to three lamps.

All holders for single-pin based lamps operate on the principle of the turret holders described above. (See C and D, Fig. 3). The wiring is such that the service to the transformer-ballast is through the holder not containing a spring and is open at all times when the pin is not inserted in the holder. Thus the lamp cannot be removed without first opening this service and the ballast will remain dead until the lamp is fully restored.

Color of Light

A few people seem to thrive on change, but more become accustomed to a given condition and look upon this as most desirable, if not perfect. This retarded the early acceptance of the color of light from fluorescent lamps, creating a criticism that still is heard occasionally. Despite the fact that colors of materials could never be compared accurately under the predominately red light from the incandescent lamp, there was a feeling that this was a good standard. References were made to daylight in the arguments which ensued, although that too is a poor standard. (There is a vast difference between the cold white light from a clear north sky and the warm light from a setting sun. The latter, incidentally, is quite similar in color value to the light from an incandescent lamp.)

Fluorescent lamps emit the color of light which is natural for the various phosphors or fluorescing powders on the inner surfaces of the tubes, plus the addition in some cases of that due to a small amount of pigment. (No phosphors have yet been found which radiate at distinctly red or yellow frequencies.) White light, of varying degrees, is obtained from a combination of several phosphor powders. Gradations of this light may be obtained from an assortment of lamps of various colors.

Normal uses of fluorescent lamps have been aided recently by the introduction of a simplified line of four white lamps. These are based on a "cool-white" color similar to daylight, and a "warm white" color similar to that from the traditional filament lamp. The "standard cool white" and "standard warm white" lamps have high efficiencies, the "deluxe cool white" and "deluxe warm white" lamps are better in each case for color rendering.

The trend in the use of these lamps is toward the standard cool white for plant lighting, large office lighting, etc., while deluxe cool white

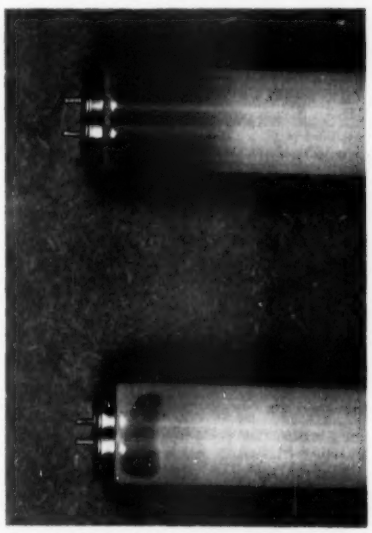


Fig. 2. Tube blackening of upper tube shows typical deposit from cathode toward end of life. The bottom tube shows the dim or dark spot(s) due to condensation of mercury, which, in turn, was caused by cooling of tube wall

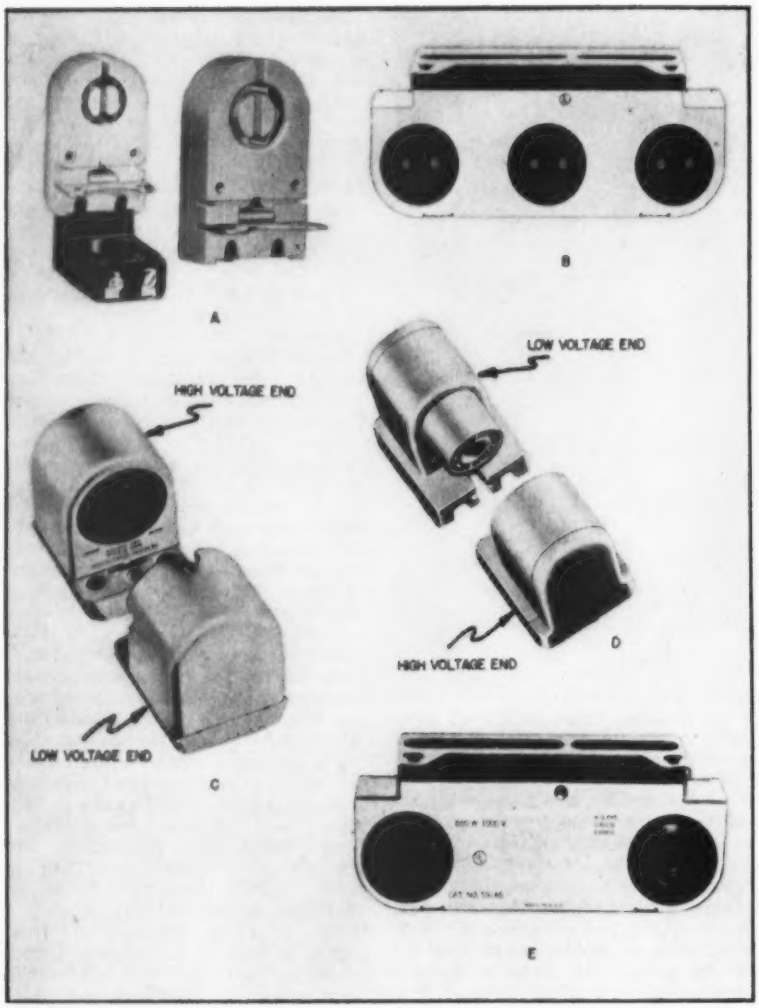


Fig. 3. Various fluorescent lamp holders, (A) Representative holder for bipin base lamps; (B) Turret holder for three bipin lamps; (C) and (D) Typical one-lamp holders; and (E) Multiple lamp holder for single-pin lamps, are shown

is used in color critical areas and in fine offices, reception areas, etc. De-luxe warm white is used in dining rooms, cafeterias and other places where a home-like atmosphere with good rendition of color is desired.

Size of Lamps and Fixtures

A variety of lamps of pastel or nearly pure colors of blue, green, gold, pink and red are also available, for decorative purposes. These colors include all of the light energy emitted by the phosphors, with some qualification by pigment in the case of gold and red. Similar colors may be obtained from incandescent lamps, but only by a filtering process which absorbs much of the light. Fluorescent lamps are therefore much more efficient producers of colored light than are the colored incandescent lamps.

The same objection to change applied to the large physical size of the fluorescent lamps and of the fixtures to accommodate them. A tube 4 ft long seemed an absurd substitute for a 40-watt bulb only 4¼ in. long. That the tube emitted as much light as a 150-watt bulb 6-3/16 in. long helped a little.

The fact that the light transmitting area of the tube resulted in a greatly reduced brightness, permitting more exposure and a more efficient fixture, helped still more. This lower brightness also resulted in a better quality of illumination because of the lower brightness of image reflections in the work and its surroundings. This was admittedly very desirable. The longer fixtures could also be joined together in lines or grids of light, in a pleasing architectural pattern which, incidentally, gave an improved distribution of the light. The radiated heat from the fluorescent sources was low and the luminous efficiency was high, both in comparison with incandescent lamps.

In a short time all of these advantages, plus the ever present desire for more illumination of a better quality and plus a growing familiarity with the new appearance of the lighting equipment, won so effectively for the fluorescent lamps that the size objection is seldom heard today.

Exposed Lamps

At first the brightness of fluorescent lamps was so low when compared with that of incandescent lamps that fixtures employing completely exposed tubes were frequently used. The effect of this on vision can be observed by looking across a room so lighted and alternately screening and exposing the lamps, using a card or paper held in the hand. Equal comfort in such a test will be found only when the lamps are shielded from direct view by portions of the fixture or, in the case of very small rooms, by the eyebrows of the observer.

It is true of course, as has been indicated, that the lower brightness of the fluorescent lamp requires less shielding and therefore offers a higher utilization of the light, a substantial economic gain. It is also true however, that, as higher levels of illumination become practicable and are used, increasing attention is being and will be paid to quality illumination and seeing conditions. The matter of proper shielding will therefore become of ever greater importance.

Fixture Types

Line drawings representing typical fluorescent fixtures, currently available and in use, are shown in Fig. 4. Much information is given with the drawings but it is desired to emphasize several important characteristics in greater detail.

Fixtures with downward light output only cannot possibly provide fully comfortable illumination unless the floor, ceiling and room surfaces, as well as the room furnishings, are light in color. Otherwise the upper portion of the room will be in darkness and the contrast brightness between this and the fixture will be excessive. The exact upward and downward components for any fixture, in per cent of the light emitted by the lamp, is available from the manufacturer.

Screening of the lamps from direct

Bibliography

The reader is referred to the following publications for further elaboration of any of the points covered: The second edition of *Fluorescent Lighting Manual*, by Charles L. Amick, of the Lamp Division of General Electric Co., which appeared in 1947. The revised edition, 1952, of the *IES Lighting Handbook*, published by Illuminating Engineering Society, New York.

view, for comfortable illumination results, may be accomplished by the use of obscuring glass or plastic, by louvers or baffles or just by a well designed reflector. When a diffusing medium is not placed between the lamps and the work area, low brightness lamps assist in reducing the excessively bright reflections from the work.

Ease of cleaning is a very important feature. Ease of cleaning facilitates frequent cleaning. This increases the average level of illumination from a given installation, or the converse—justifies a less expensive installation for the same required results. It can easily be demonstrated that easy cleaning (and a suitable cleaning schedule) can compensate for a lower utilization efficiency.

Some fixtures accumulate less soil than others. This may be due in part to "air-flow" over the reflecting and transmitting surfaces. Air, heated by the lamps, rises through the fixture, helping to prevent the deposit of dust and to remove any that has accumulated. This feature is surprisingly important.

Another influence is the position of the surfaces from the standpoint of permitting the dust particles to drop off.

A third is the nature of the surface, a hard smooth surface such as glass, porcelain enamel or alzac aluminum hold less than a rough soft surface. Plastic will accumulate a static electric charge from the air unless it is properly cleaned, leaving a conducting film of detergent on it. Such a charge will attract dust.

Group Replacement

Typical end blackening of fluorescent lamps is shown in Fig. 2. This occurs because of the deposit of material displaced from the cathodes and usually indicates long burning hours to date. In the event that group replacement of lamps is practised—to be discussed in a future article on the economics of lighting installations—only lamps which have but little of this blackening would be saved.

Smaller spots of black sometimes appear, usually due to a condensation of mercury in the tube because of a cooling object near the tube surface. These frequently will evaporate if the lamp is turned 180 deg. At least they will not then be conspicuous. They have no particular significance with reference to the lamp operation or the amount of light output.

The cost of fluorescent lighting, in fact of all lighting, becomes a part of the production expense in the operation of any establishment. As such, it will be analyzed fully in a later article. It will be stated here merely that the savings in the operation of a well designed fluorescent lighting installation, when compared with an incandescent lamp installation delivering comparable illumination, will more than compensate in a short time for the higher first cost for fluorescent. In other words, almost invariably, the fluorescent lighting will be found to be the less expensive for industrial plants in the long run.

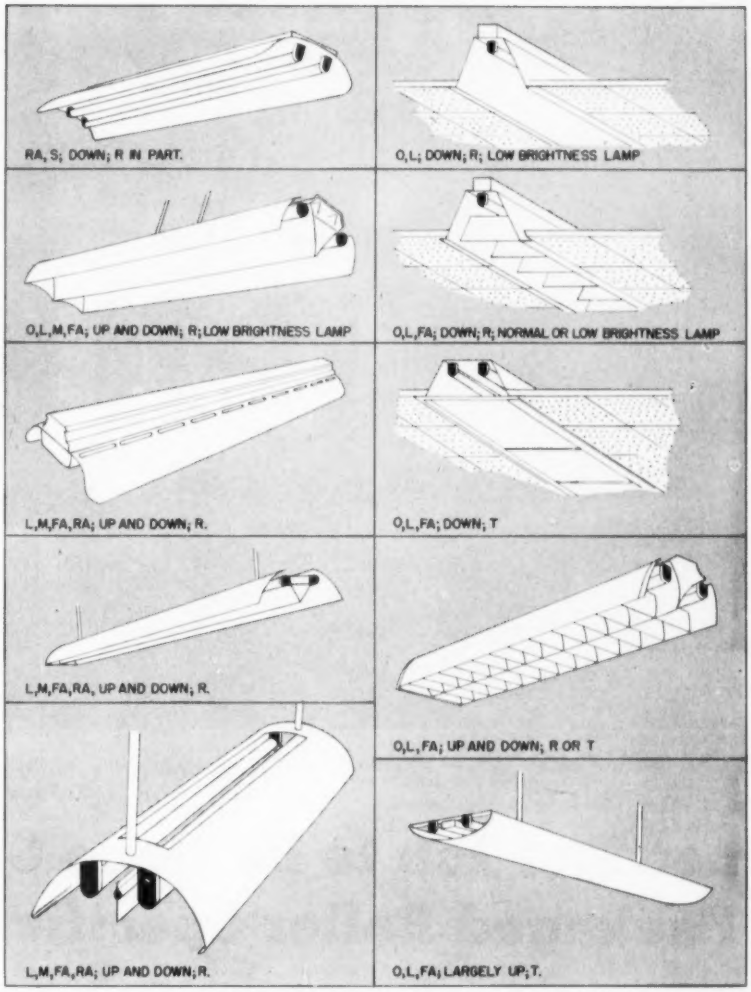

RA, S; DOWN; R IN PART.
O,L; DOWN; R; LOW BRIGHTNESS LAMP
O,L,M,FA; UP AND DOWN; R; LOW BRIGHTNESS LAMP
O,L,FA; DOWN; R; NORMAL OR LOW BRIGHTNESS LAMP
L,M,FA,RA; UP AND DOWN; R.
O,L,FA; DOWN; T
L,M,FA,RA; UP AND DOWN; R.
O,L,FA; UP AND DOWN; R OR T
L,M,FA,RA; UP AND DOWN; R.
O,L,FA; LARGELY UP; T.

Fig. 4. Typical luminaires useful in industrial Offices (O), Laboratories (L), Machine rooms (M), Fine Assembly (FA), Rough Assembly (RA), and Storage (S); distribution up, down or both; luminous appearance by Transmitted (T) or Reflected (R) light. All types shown above usually equipped with normal brightness lamps unless low brightness is specifically indicated in orders

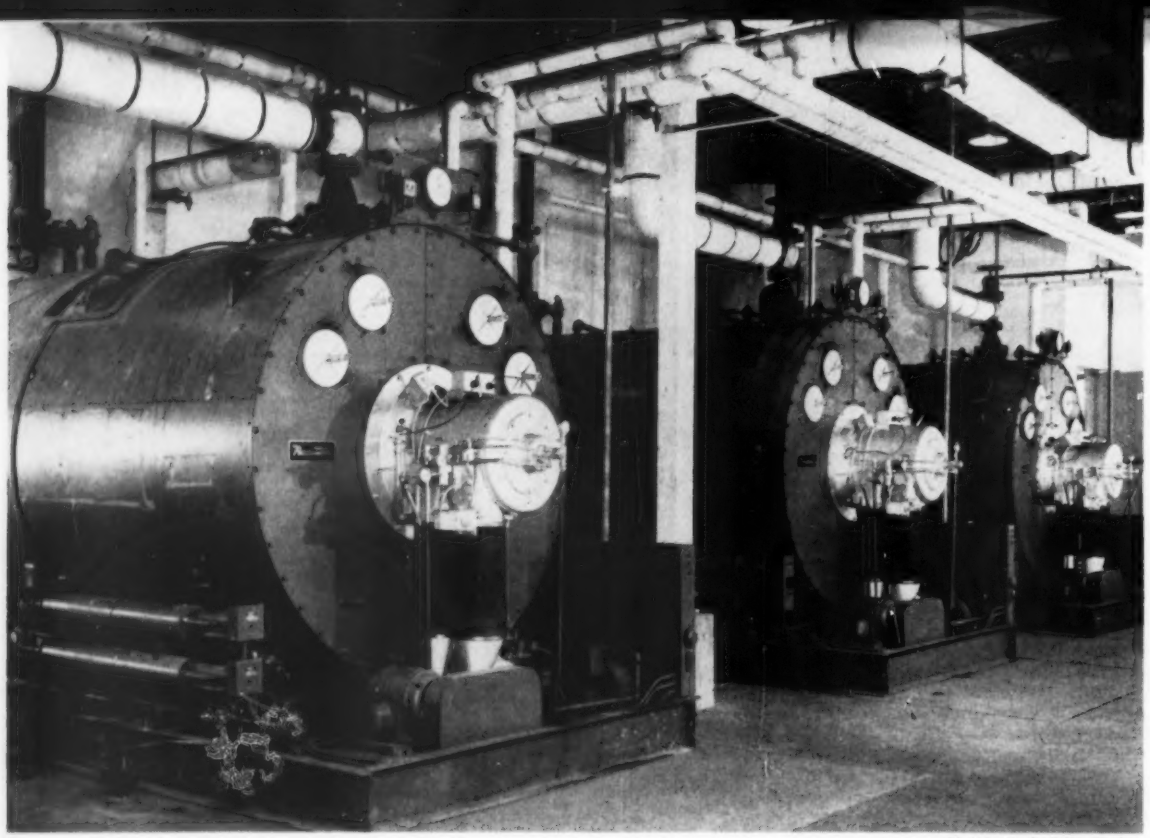
Even the lamp cost favors the fluorescent lamp on the basis of the same amount of emitted light for a given length of time. The list price of the common warm white 40-watt fluorescent lamp is $1.05, it emits 2500 lumens or units of light and is rated to last 7500 hours, average. The list price of the 150-watt incandescent lamp is 20 cents, it emits 2650 lumens and is rated at 750 hours. The relative first cost for about the same amount of light (lumens times hours) is 10.5 cents for the fluorescent compared to 20 cents for the incandescent.

The relative energy consumption by the fluorescent lamp, even including the ballast losses, is still less than one-half of that for the incandescent lamp. About the same relations would be found, per unit of light, in comparing the fluorescent lamp with the 300-watt incandescent lamp.

An increase in the life of the incandescent lamps by low voltage burning would not equalize the two on first cost as much as it would increase the advantage of the fluorescent in energy consumption.

Reprints Will Be Available

Due to the unprecedented interest in reprints of the entire lighting series, the request for reprints is being extended to March 31, 1953. Those readers wishing to reserve a set of reprints may do so by writing to The Editor, Plant Engineering, 110 S. Dearborn St., Chicago 3, Illinois. First set is free, additional sets are $1.00 each.



Photos: Orr & Sembower, Inc.

Fig. 1. Multiple boilers may be installed instead of one larger boiler to better handle alternate light and heavy loads

Let The Job to Be Done Govern Packaged Boiler Specifications

All factors, including heating load and steam load, steam pressure desired, whether electric power is bought or generated, license requirements, and general over-all economics, should be taken into consideration in selecting, specifying packaged boiler units for your plant

By ROBERT E. DERBY, President, A. C. Wood Associates, Inc.

PACKAGED AUTOMATIC boilers are finding increasing acceptance in many fields. These units which can be installed with a minimum expense for appurtenances and accessory equipment, foundations, and erection services, are particularly applicable for steam loads up to 500 hp or 15,000 lb per hr.

In this capacity range a comparison between the cost of construction of a boiler plant involving the installation of a packaged automatic boiler and one in which the boiler, fuel burning facilities, auxiliaries and various appurtenant equipment are individually designed and purchased indicates that the package boiler plant could be installed for approximately $1.00 per pound of steam generated, whereas the custom designed plant would cost approximately $2.00 to $2.50 per pound. The installation of the packaged automatic unit usually involves only the connection of a vent for flue gases, facilities for fuel and water, and a supply of electricity.

In making the studies and investigations associated with the installation of new steam generating facilities there are many instances where the installation of the packaged automatic boiler proves the most economical and satisfactory solution. A case in point is a survey and investigation that was recently conducted by our firm for a client who operates a large building for tenant warehouse space. The steam engine electric generating facilities had long since been shut down in favor of purchased power. However, the steam generating equipment was still operated at 100 psig pressure, serving the major space heating load through a pressure reducing valve, and directly, at high pressure, a candy manufacturer who required a small quantity of steam for several jacketed kettles, for eight hours a day, five days a week. As a result of a local ordinance, the high pressure operation of the boiler plant necessitated that a licensed engineer be in attendance on a twenty-four hour basis.

The obvious answer to this problem was the installation of a 100 psig packaged unit steam boiler at the candy cooking operation, and the change-over of the existing boilers for automatic low pressure operation

to serve only the space heating load. The saving in cost for attending engineer operating personnel and fuel for the low pressure plant more than returned the cost of the entire change-over installation.

Other studies and investigations of steam generating facilities have indicated that the automatic package type boiler is particularly applicable when the addition of steam loads to an existing steam distribution system are contemplated. In many cases the packaged unit can be installed, at the load, at a cost that would be less than for the extension of the steam and condensate piping of the steam distribution system.

In some instances where additional steam generating capacity is required it is more economical to install a battery of several package boilers rather than a large single custom designed unit.

Boiler Design

In the actual selection of a packaged automatic boiler, there are several requirements to keep in mind. There are many modifications of design that should be considered, accessories to be included or bought separately, and operating cycle — whether on-off or full modulating on varying loads.

Automatic package unit steam generators are built in two-pass, three-pass, and four-pass designs. Since heating surface must be sufficient to absorb the Btu content of the fuel burned the number of passes through the boiler is largely inconsequential. Being in its simplest form a tube-bundle heat exchanger, a boiler can be built in any number of sizes and shapes providing equal efficiencies. If a single-pass boiler were designed it would be excessively long and unwieldy.

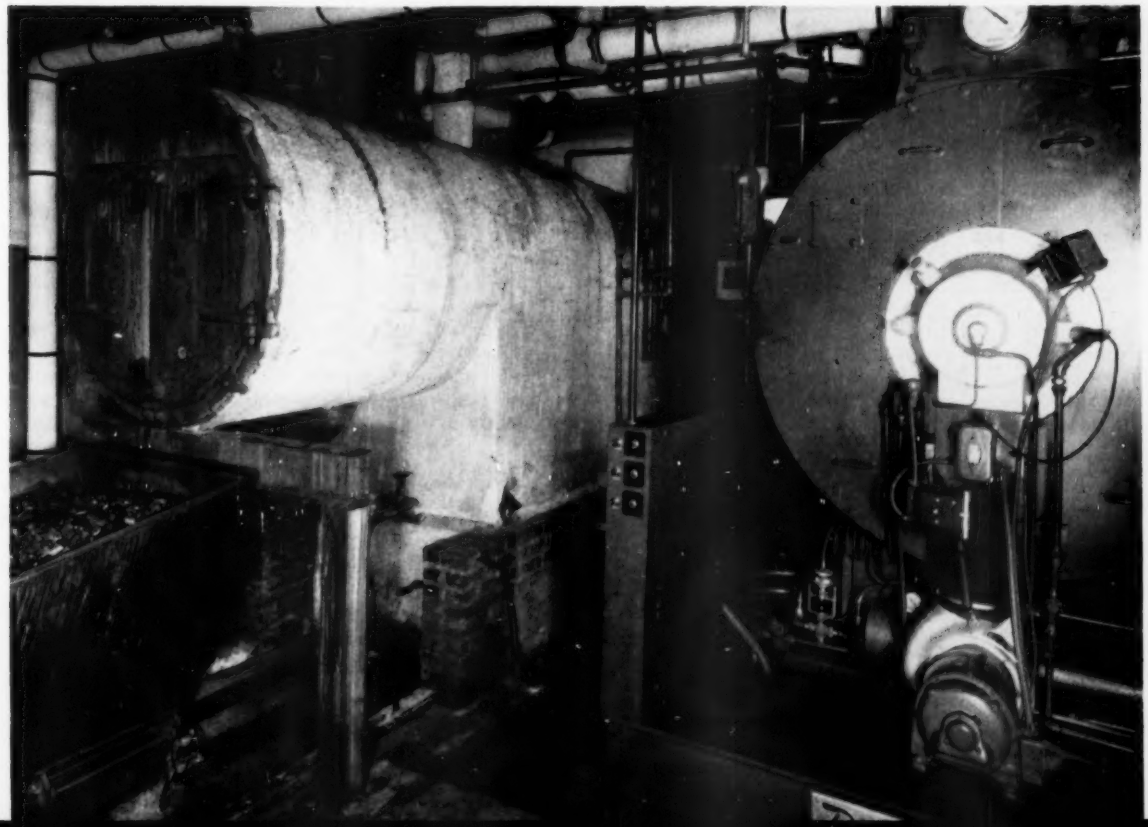
In a three-pass boiler the combustion gases pass first through a central internal furnace combustion tube. The flow of gases is reversed against an integral refractory rear target wall and the gases then pass through a bank of fire-tubes in the lower segment of the boiler toward the front. At the front, gas temperature has been reduced to less than 1000 F and insulating board can be used to reverse the flow again toward the rear. The gases are split into two lateral banks of tubes on either side of the internal furnace combustion tube from which they emerge at the breeching with a flue gas temperature usually something less than 500 F.

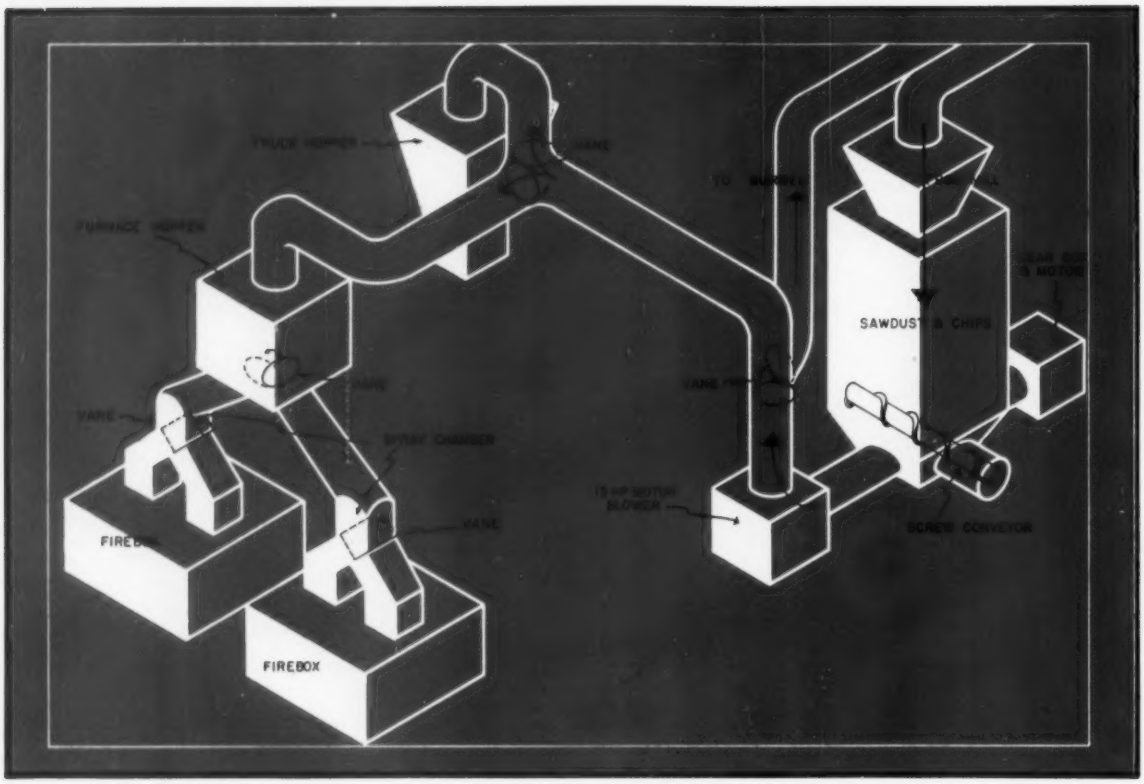
In some cases a condensate and makeup collecting and feeding arrangement may be included with the automatic packaged unit boiler, on the same skid base or separately mounted. Heavy oil heating and recirculating systems may likewise be included or omitted. In the case of gas fuel, a pressure regulating valve may be furnished by some packaged unit boiler manufacturers while other manufacturers may expect this to be furnished by the user or the installing contractor. Requests for quotations should be carefully worded and all bids should be carefully studied to determine the extent of accessory equipment being quoted. Any departures from the initial invitation should be noted in tabulating the resulting bids.

"Let her alone! Every little bit helps."

While automatic package unit boilers can be purchased direct from the manufacturer or his distributor by the customer and installed by the customer himself, it is always wise to evaluate the useful services that can be rendered by a consulting engineer. The cost of competent consulting engineering service is particularly justified when a company is engaged principally in a production or service industry where a separate and continuous plant engineering staff is not maintained.

Fig. 2. **The 100 hp packaged boiler unit at the right has replaced a brick-set, coal-fired boiler at a soft-drink plant**





Schematic drawing of ductwork for sawdust stoking system at E. K. Wood Lumber Co. Note vanes for flow directors

Plant-Designed Fireproof System Burns Sawdust Safely

EVERY PLANT, everywhere, would like to use wastes from its production line to create at least part of the power and steam to run its production lines. Not every plant can, of course, but hundreds of wood products industries do. Many another plant, whose end product is a combustible (wood, corn cobs, fibrous materials) hesitates burning its wastes because of danger from fire or explosion.

E. K. Wood Lumber Co., Los Angeles, fires its two 400 hp steam boilers which furnish steam for plant heating and for its dry kilns, with sawdust—waste from its production lines.

By plant-designing a clever stoking system, which is fire-proof, and by installation of an even-feed hopper, E. K. Wood has found that it can use its wastes efficiently.

There are a handful of problems connected with fuel sawdust, all of them solved by the company's plant-designed system. Some of these problems: 1. Danger from fire and explosion; 2. Excessive smoke; 3. Clogged feeder conveyors; 4. Varying burning qualities of sawdust from douglas fir, redwood and hardwoods.

The company's system, designed by Maintenance Superintendent R. J. Smith, begins by collecting mill waste sawdust via tube conveyors, and associated blowers. Mill wastes are carried to two dust collectors via a 74 and 200 hp blower. These collectors, in turn, feed a 75 hp transfer fan. From this fan, sawdust goes either directly to a large outdoor cyclone dust collector, thence to a silo type burner where it is burned, or is directed to a gravity-feed bin mounted atop a 40 ft high reinforced concrete and wood sawdust bin—for use as boiler firebox fuel.

One of the problems in using sawdust in a bin of this type is the tendency for uneven feed and jamming. To get around this, Maintenance Superintendent Smith designed three sets of dual horizontal spiral conveyors, 10-in. diameter, which work in individual concrete troughs in the bin's bottom. These spiral conveyors, working off a 5 hp motor, are geared to a 36 to 1 reducing gear and driven by a standard duty 1¼ pitch chain. Each set of two conveyors is separately geared and clutched, so that all three pairs may be working simultaneously, or only one or two pairs. This clutching arrangement allows the feeder bin to be emptied evenly.

Conveyors carry the sawdust along the bin's bottom to a transverse screw conveyor installed in a metal trough, and driven by a 3 hp motor working through another reducing gear. This transverse conveyor is 12-in. in diameter, and deposits the sawdust at the intake end of a conveyor pipe, which is associated with a 15 hp blower. The blower delivers sawdust, via an overhead galvanized steel duct and dust collector to either the furnace feed hopper, the truck feed hopper, or back to the outdoor burner, for combustion to ash.

By these ducts, whose "Y's" are vane-controlled, about 40 per cent of

the plant's entire waste sawdust is used for boiler fuel. Another 10-20 per cent is fed into trucks and sold to other industries. The remainder is burned in the outdoor incinerators.

From the furnace hopper, sawdust is fed by gravity into one of two spray chambers, and from these, into one of the two boiler fireboxes.

The spray chambers are safety devices, and consist of a galvanized metal box, rigged with ½-in. fog nozzles. Idea here is to raise the moisture content of the sawdust, prior to entering the firebox, to a point high enough to prevent flashback. E. K. Wood Lumber Co. remembers only too well a disastrous fire a few years ago (before its present system was installed), which razed its boiler rooms and sawdust storage bin.

The spray chambers are one safety measure. Another is the 15 hp blower. Once sufficient sawdust has been carried to the firebox feeder hoppers, the entire line is purged of sawdust and of dust by running the blower a few minutes. Purging this line has prevented flashback into the main sawdust bin.

Mr. Smith has rigged a smoke detector in the boilers' stack breeching. When this detector signals the boiler room operator, he can control his smoke by one of three methods: 1. Amount of boiler firebox stoking (via vane from furnace hopper to firebox); 2. Amount of wetting in spray chamber; 3. By increased oxygen to fireboxes by opening firebox doors. Another signal indicates that bin conveyors are operating.

The 15 hp blower, which is the heart of the sawdust feed system, comes into play to purge the entire line to furnace, truck station and to the outdoor burner: after truck filling; after quantity delivery to outdoor burner; or after filling of furnace hopper.

The spray chambers are used only during actual stoking operation, since the air-dust mixture ratio does not present an explosion hazard except when fuel is falling free in the stoker tubes. Of course, dust floating in a room or bin is potentially dangerous, but this condition is not covered by the stoker tube application to fog nozzles. Fog nozzles, however, have eliminated flashback hazards during stoking.

One of the reasons why the conveyors do an efficient job, is that they are mounted in their respective troughs (either concrete or steel) with only about ½-in. clearance. This prevents bridging or hang-up in the conveyor troughs.

Wooden sawdust bin for fuel storage with hopper located atop the bin

At top of the duct (arrow) there is a spray chamber installed for safety

Clutched and chain-driven horizontal conveyors which empty bin evenly

Plant Design Solved These Problems —

1. Land Subsidence 2. Corrosion 3. Sanitation

Corrosion and land subsidence were the two big engineering headaches that had to be solved . . . In addition, fish had to be moved into the plant quickly for processing and canning . . . Plus, the need for sanitation facilities throughout the plant . . . All these problems were solved

HERALDED along Pacific Coast waterfronts as the finest tuna cannery in the world is French Sardine Company's multi-million dollar, 194,000 sq ft Terminal Island (Calif.) plant, which has the capacity to process 400 tons of tuna during a single 8 hour shift.

Star-Kist Tuna's new home—the company's fifth plant—had to lick the twin engineering headache of corrosion and land subsidence. For Terminal Island, industrial heart of Long Beach harbor, has sunk (at its east end) some 17 ft since 1937. Industries on the island have spent $35,000,000 in anti-land subsidence work to save property worth $500,000,000. Only recently, however, Robert R. Shoemaker, chief engineer for the harbor, predicted a gradual tapering off of sinkage—with the end in sight by 1967 as oil withdrawal, a main subsidence cause, is controlled.

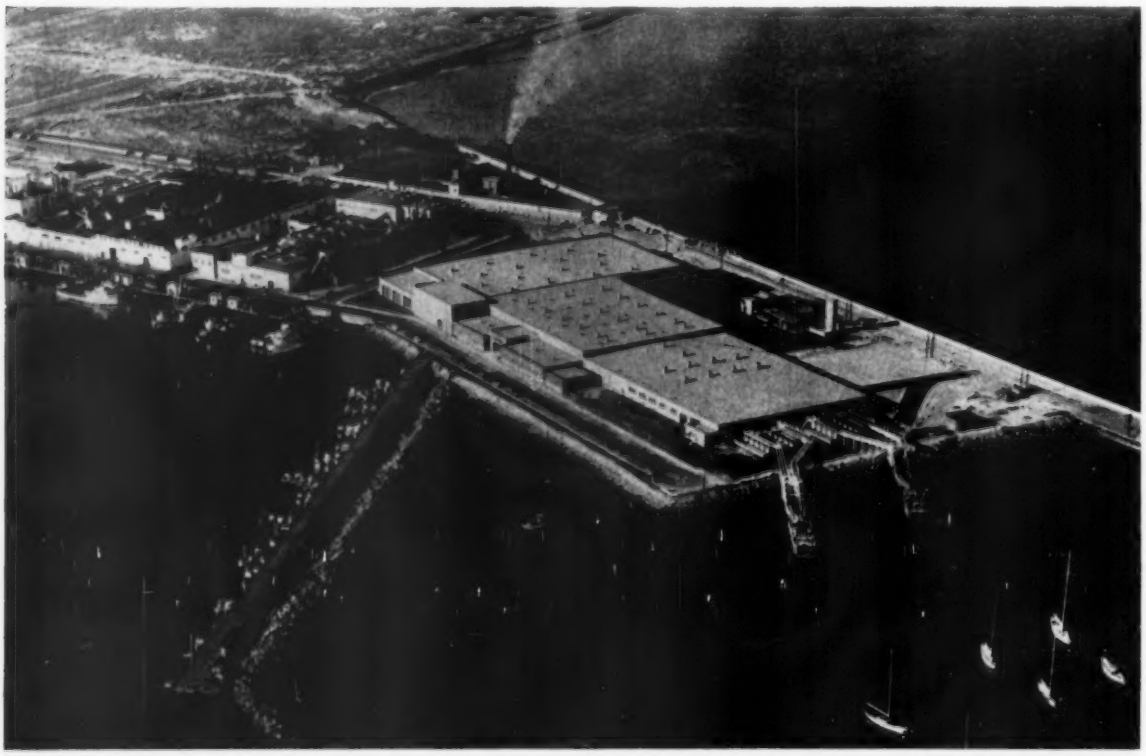
Construction Facts

The plant was built on a sand dredge fill—about 350,000 cu yd of it—with rock dikes built on its west and south sides. Extensive subsurface investigation provided figures for calculation of anticipated land subsidence. Erection of the tilt-up constructed plant began within 30 days after final fill compaction. The building is supported by 600 40- to 60-ft piles driven to refusal depth and weighing 18 lb to the foot.

Some 200 reinforced concrete panels, poured on the main floor slab, saved almost 40 per cent over conventional pouring. Largest panel sections were 20- by 34-ft and weighed 30 tons.

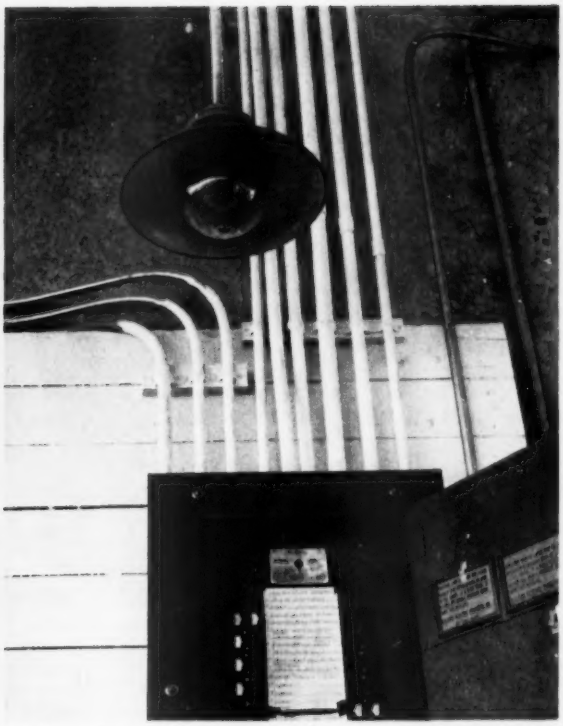
"Perishable" key-notes the plant's engineering. Most plants can shut down temporarily without material loss. But with an average tuna clipper unloading $60,000 in frozen fish, there's slim margin for error.

Materials flow is straight line—from the twin finger piers (20 ft wide, 210 ft long) to final storage of the canned fish. Tuna clipper unloading, once a hand-truck operation requiring 8 men per boat (with a maximum of 4 vessels unloading simultaneously) has been cut to 2 men per boat. This 75 per cent labor savings has gone into a flume and conveyor system. Flumes,



Aerial view of the tuna canning plant on Terminal Island. Note the rock dikes built on west and south sides of plant

Anti-fly fans direct an airstream toward the open door



Lighting fixtures of vapor-tight design are used in the plant

washed by salt water, carry frozen fish from the ships' holds to the butchering section, the first processing point. Four 200-ft long flumes, each supplied with 2000-3000 gpm of sea water by pumps driven by 20 hp, totally enclosed motors, carry fish into the plant in something less than 3 minutes, ship-to-shore.

Combating Corrosion

Corrosion being a major problem, all motors are totally enclosed; all lighting fixtures are of vapor-tight design. Electrical runs are of rigid conduit. Plant lighting is keyed to 4 substations—a unique circuit arrangement which sees 480 v carried from the main power station to these 4 subs. At each sub the 3-phase, 480 v is stepped down through a 3-phase, 4-wire secondary to 110 v, minimizing line losses. These 110 v outlets—at the substation's panel—can be bridged if 208 v, 3-phase is needed. The machinery is run off 5 substations, which are supplied with 480 v, 400 amps. All substation components are clearly labeled with ¼-in wide, embossed copper name plates.

Next to shut-down and corrosion, the biggest canning plant problem is sanitation. Some of the major sanitary features of the new plant are: 1. Round packing table supports instead of sharp-cornered, particle-collecting straight edges. 2. The junction of tilt-up walls with the floor slab is "rounded out" with a grouting of concrete so there are no corners. 3. The extensive system of floor drains and general plant drainage. 4. The use of 0.024 in. thick stainless steel conveyors on tuna cleaning tables. The steel conveyors are easily cleaned and light-weight. They are trued by center-positioned rollers. 5. Fan-supplied, anti-fly airstream that is directed at all cleaning-room doors. 6. The waste-disposal, in-floor conveyor, which carries waste to loading docks outside, where it is trucked to nearby fish meal by-products plant. The in-floor conveyor consists of a 12-in. diam screw which conveys wastes from the 8 cleaning tables at the rate of 10 to 15 ton per hour.

Here is one of the lighting substations which are spotted throughout the plant

Flies Meet Their Match

Flies have apparently met their match at this plant, through a two-pronged attack which includes special lighting and door fans. Chief electrician Bonnie C. Quinn has some theories about flies. One of these: that flies usually congregate in direct light. Thus, all plant lighting is subdued, with no direct light anywhere. Fluorescent lights 48 in. long, and 4 tubes to a fixture are one solution. These—325 of them—hang over the packing area and give 75 ft-c at conveyor tops and at inspection stations, 50 ft-c on the

cleaning shelves, directly beneath.

All tubes are in safety sockets, so they cannot drop out and contaminate conveyors carrying tuna loins. Another feature: each fixture is individually hung 10 ft 6 in. above the floor and plugged into separate outlets every 10 ft in the channels. When a lamp goes out, the entire fixture is removed simply by unhooking it, and it is replaced.

The subdued light effect is carried throughout the packing and cleaning sections — with all skylights tinted green, matching light green walls.

The chief electrician feels that subdued lights definitely aren't inviting to flies, but that big patches of daylight in a food plant area certainly are.

Another Anti-Fly Device

The other anti-fly device, engineered into the facility, is a series of double fans (exhaust type) which direct an airstream at all doors. Flies don't like to fly upstream—and stay out. The engineering of these exhaust units is interesting. Two, 24-in. bladed, 450 rpm, 1/6 hp fans are mounted 15 ft back from the door, and hung so that they are on a line with the tops of doors. The fans are angled 45 deg downward, and each airstream is dead-centered at the opening. One fan protects half of each 15 by 15-ft opening.

The subdued lighting has been very helpful in keeping flies under control, but the real factor is the doorway airstream. Incidentally, the airstream is hardly noticeable to workers—but plenty bothersome to flies.

The plant's industrial water system has 50,000 gal of standby storage tanks, with pumps capable of delivering 2000 gpm. Salt water—used only in the flumes—is delivered at 2,000 to 3,000 gpm from each pier-end pump. Some 60,000 lb of steam per hour is received from a central steam generating plant, a co-operative power unit built by Terminal Island canneries.

Enclosed motors under cleaning tables allow thorough wash-down of the area

Designed for Quick Clean-Up

Biggest day-to-day maintenance job in the canning industry—and especially in fish handling—is clean up. In the packing room alone (which is 250 by 190-ft), an 8-man crew spends 8 hours at the job after the shift has shut down. Pressure hoses and floor troughs under each table greatly simplify this job. These open troughs are smooth concrete (so as not to pick up food particles) and run the entire length of packing tables, about 140 ft. Drains are round-bottomed (again, no sharp, unsanitary corners) and 12 by 12-in., with drainage to them at a slope of $\frac{1}{8}$ in. to a foot from the center of aisles between tables. These troughs empty into a filter system, which removes non-solubles, empties water to harbor, and sends wastes to a truck-loading station to be made into fish meal and other by-products. The round-bottom design is the most important feature of the drains.

Since all cleaning room motors are enclosed, this permits the units to be hosed down during clean-up. However, the very thin stainless steel conveyors (0.024 in.) are washed with warm—but not hot—water since they can warp with extremes of heat or cold.

Subdued lighting, sloping aisles, undertable drains are just a few of the sanitary features of cleaning-packaging area

FLUID POWER SYSTEMS
Solve Many Production Problems

This is the first article in a comprehensive series on fluid power systems . . . It covers the general characteristics of the fluid power field . . . Article answers such questions as: . . . On what equipment is it applicable? . . . Which fluid power should be used? . . . What fluid medium? . . . What about consideration of operating costs?

By H. L. STEWART, Special Engineering, Logansport Machine Co., Inc., Logansport, Indiana

TODAY, AS WE STRIVE for greater production with the minimum of downtime and maintenance expense, fluid power systems are being put into service in ever increasing quantities.

Nearly three centuries ago when Blaise Pascal, the famous French scientist, evolved the basic law of fluid mechanics which states that "pressure exerted anywhere upon the surface of a liquid enclosed in a vessel is transmitted undiminished in all directions, and acts with equal force upon all equal surfaces, and at right angles to the surface," it is doubtful that even he realized the vast importance that he would play on the lives of the people of the Twentieth Century.

In the layman's language this means that if you have a piston of one square inch area and a force of 100 lb is exerted against it, you can raise a 10,000 lb load on another piston which is connected to the same hydraulic system if this piston has an area of 100 sq in. It must be remembered, however, that the small piston must move 10 in. in order to move the large piston one inch.

Although Pascal's theorem was evolved in 1658, it could not be put into actual practice until late in the Eighteenth Century due to the inability to produce a suitable piston packing. An Englishman, Josiah Brahmah, invented the cup packing for hydraulic pistons which afforded minimum leakage of oil past the piston and helped advance the field of fluid mechanics.

About the middle of the Nineteenth Century the English made considerable use of water hydraulic presses for performing many heavy duty operations. Their source of power was usually from a central high pressure water pumping station.

Somewhere around 1895 Armstrong invented the hydraulic accumulator. The hydraulic accumulator in its present day form plays a very important part in many hydraulic systems.

Although the use of fluid power developed rather slowly due to many problems and obstacles involved, this medium of motivation grew by leaps and bounds during the World War II period.

While we could consider air, oil, steam, and water as fluid power transmitters, this series of articles will deal only with the two which are by far the most popular today—air and oil. This article will cover fluid power systems in general, the next five will outline various hydraulic systems and their components, and the remainder will dwell upon air and air-hydraulic systems.

Mention should be made here that high pressure water hydraulic systems, especially the central station type, have high maintenance costs. Raw water, and even water that is insufficiently treated, causes considerable damage to circuit components, especially to control valves where wire drawing occurs on the spools and in the bodies. Rust and scale are also damaging to the whole system.

Whichever fluid is chosen for the medium of operation of the system, this system may be broken down into four main divisions which closely parallel those divisions in an electrical system. First, the power device parallels the electrical generating station; second, the control valves parallel switches, resistors, timers, pressure switches, relays, etc.; third, the lines in which the fluid power flows parallel the electrical lines; and fourth, the fluid power motor whether it be a rotating or non-rotating cylinder, or a fluid power motor parallels solenoids and electric motors. The four main divisions in a fluid power system are shown in Fig. 1.

A short time ago a number of conferences were held in Detroit in which a set of standards were devised for industrial hydraulic and pneumatic equipment. These are well known as the Joint Industry Conference Standards for Industrial Equipment. Represented at these conferences were hydraulic equipment manufacturers, pneumatic equipment manufacturers, industrial equipment users, machine tool builders, packing and seal manufacturers, press manufacturers, resist-

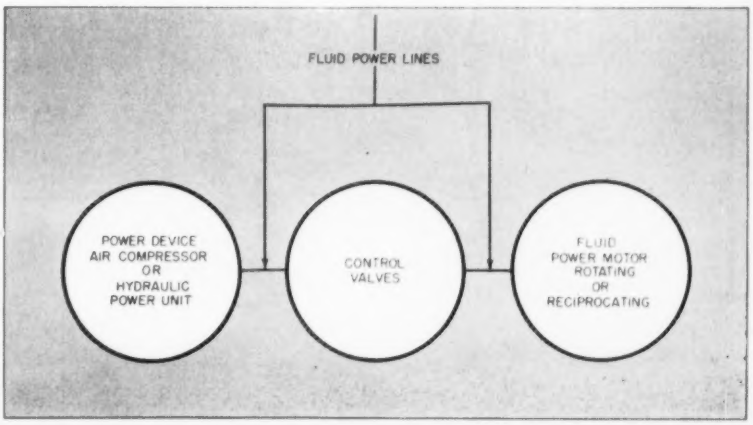


Fig. 1. This sketch shows the four main divisions in a fluid power system

J.I.C. HYDRAULIC STANDARDS FOR INDUSTRIAL EQUIPMENT

LINES
- LINE, WORKING
- LINE, PILOT (L → 20W)
- LINE, DRAIN (L ← 5W)
- LINE, FLEXIBLE
- CONNECTOR (DOT TO BE 3X WIDTH OF ASSOCIATED LINE)
- DIRECTION OF FLOW
- LINE, PASSING
- LINE, JOINING (TEE CROSS ETC.) DOT TO BE 3 X W)
- RESERVOIR (FLUID TANK)
- LINE, TO RESERVOIR ABOVE FLUID LEVEL
- BELOW FLUID LEVEL
- MANIFOLD, VENTED
- PLUG OR PLUGGED CONNECTION
- TEST STATION (GAGE CONNECTION)
- POWER TAKE-OFF
- RESTRICTION, CHOKE FIXED VISCOUS
- RESTRICTION, ORIFICE, FIXED NON-VISCOUS

PUMPS
- PUMP, SINGLE FIXED DISPLACEMENT (PF)
- PUMP, SINGLE VARIABLE DISPLACEMENT (PV)

MOTORS AND CYLINDERS
- MOTOR, ROTARY FIXED DISPLACEMENT (MF)
- MOTOR, ROTARY VARIABLE DISPLACEMENT (MV)
- MOTOR, OSCILLATING (MO)
- CYLINDER, SINGLE ACTING PLUNGER TYPE
- PISTON TYPE
- CYLINDER, DOUBLE ACTING SINGLE END ROD
- DOUBLE END ROD

MISCELLANEOUS UNITS
- MOTOR, DRIVE, ELECTRIC (ELEC MTR)
- HEAT EXCHANGER (HE)
- INTENSIFIER (INT)
- ACCUMULATOR (ACC)
- FILTER (FILT)
- STRAINER (STRN)
- PRESSURE SWITCH (PR SW)
- PRESSURE GAGE
- SPRING
- SHAFT, ROTATING
- COMPONENT ENCLOSURE

VALVES
- VALVE, CHECK
- VALVE, RESTRICTION, CHOKE VARIABLE VISCOUS
- VALVE, RESTRICTION, ORIFICE VARIABLE NON-VISCOUS
- VALVE, BASIC SYMBOL (INSERT MODEL NO. FOR SPECIAL VALVES)
- METHOD OF INDICATING INTERNAL FLOW

VALVE EXAMPLES
- VALVE, MANUAL SHUT OFF
- VALVE, MAXIMUM PRESSURE
- VALVE, RELIEF REMOTELY OPERATED
- VALVE, SEQUENCE DIRECTLY OPERATED
- VALVE, PRESSURE REDUCING
- VALVE, FLOW CONTROL PRESSURE COMPENSATED VISCOUS
- NON-VISCOUS
- VALVE, SHUT-OFF 2 POSITION-2 CONNECTION
- VALVE, DIRECTIONAL 2 POSITION-3 CONNECTION
- VALVE DIRECTIONAL 2 POSITION-4 CONNECTION
- VALVE, DIRECTIONAL 3 POSITION-4 CONNECTION OPEN CENTER
- VALVE, DIRECTIONAL 3 POSITION-4 CONNECTION CLOSED CENTER

METHODS OF OPERATION
- CONTROL, BASIC SYMBOL
- CONTROL, CENTRIFUGAL (CENT)
- CONTROL, COMPENSATOR (COMP)
- CONTROL, COMPENSATOR PRESSURE (PR COMP)
- CONTROL, COMPENSATOR TEMPERATURE (TEMP COMP)
- CONTROL, CYLINDER (CYL)
- CONTROL, DETENT (DET)
- CONTROL, MANUAL (MAN)
- CONTROL, MECHANICAL (MECH)
- CONTROL, MOTOR ELECTRIC (ELEC MTR)
- CONTROL, MOTOR HYDRAULIC (HYD MTR)
- CONTROL, PILOT HYDRAULIC (HYD)
- CONTROL, PILOT AIR (AIR)
- CONTROL, SERVO (SERVO)
- CONTROL, SOLENOID (SOL)
- CONTROL, SOLENOID HYD PILOT OPERATED (SOL HYD)
- CONTROL, THERMAL (THERMO)
- CONTROL, PILOT HYD. DIFFERENTIAL AREA (HYD DIFF)

J.I.C. PNEUMATIC STANDARDS FOR INDUSTRIAL EQUIPMENT

LINES
- LINE, WORKING
- LINE, PILOT
- EXHAUST
- LINE, FLEXIBLE
- CONNECTOR (DOT TO BE 3X WIDTH OF ASSOCIATED LINE)
- DIRECTION OF FLOW
- LINE, PASSING
- LINE, JOINING (TEE CROSS ETC.) (DOT TO BE 3 X W)
- STORAGE OR SURGE TANK
- PLUG OR PLUGGED CONNECTION
- TEST STATION (GAGE CONNECTION)
- POWER TAKE-OFF
- RESTRICTION, FIXED

COMPRESSORS
- COMPRESSOR, SINGLE FIXED DISPLACEMENT (CF)
- COMPRESSOR, SINGLE VARIABLE DISPLACEMENT (CV)

MOTORS AND CYLINDERS
- MOTOR, ROTARY FIXED DISPLACEMENT (MF)
- MOTOR, ROTARY VARIABLE DISPLACEMENT (MV)
- MOTOR, OSCILLATING (MO)
- CYLINDER, SINGLE ACTING PLUNGER TYPE
- PISTON TYPE
- CYLINDER, DOUBLE ACTING SINGLE END ROD
- DOUBLE END ROD
- CYLINDER, ROTATING, AIR

MISCELLANEOUS UNITS
- MOTOR, DRIVE, ELECTRIC (ELEC MTR)
- LUBRICATOR (LUB)
- INTENSIFIER (INT)
- ACCUMULATOR (ACC)
- FILTER (FILT)
- SEPARATOR (SEP)
- PRESSURE SWITCH (PR SW)
- PRESSURE GAGE
- SPRING
- SHAFT, ROTATING
- COMPONENT ENCLOSURE

VALVES
- VALVE, CHECK
- VALVE, RESTRICTION VARIABLE
- VALVE, BASIC SYMBOL (INSERT MODEL NO. FOR SPECIAL VALVE)
- METHOD OF INDICATING INTERNAL FLOW

VALVE EXAMPLES
- VALVE, MANUAL SHUT-OFF
- VALVE MAXIMUM PRESSURE
- VALVE, RELIEF REMOTELY OPERATED
- VALVE, SEQUENCE DIRECTLY OPERATED
- VALVE PRESSURE REGULATED
- VALVE, FLOW CONTROL PRESSURE COMPENSATOR
- VALVE, SHUT-OFF 2 POSITION-2 CONNECTION
- VALVE, DIRECTIONAL 2 POSITION-3 CONNECTION
- VALVE, DIRECTIONAL 2 POSITION 4 CONNECTION
- VALVE DIRECTIONAL 3 POSITION 4 CONNECTION CLOSED CENTER

METHODS OF OPERATION
- CONTROL, BASIC SYMBOL
- CONTROL, CENTRIFUGAL (CENT)
- CONTROL, COMPENSATOR (COMP)
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- CONTROL, DETENT (DET)
- CONTROL, MANUAL (MAN)
- CONTROL, MECHANICAL (MECH)
- CONTROL, MOTOR ELECTRIC (ELEC MTR)
- CONTROL, MOTOR AIR (AIR MTR)
- CONTROL, PILOT HYDRAULIC (HYD)
- CONTROL, PILOT AIR (AIR)
- CONTROL, SERVO (SERVO)
- CONTROL, SOLENOID (SOL)
- CONTROL, SOLENOID HYD. PILOT OPERATED (SOL HYD)
- CONTROL, SOLENOID AIR PILOT OPERATED (SOL AIR)
- CONTROL, THERMAL (THERMO)
- CONTROL, PILOT HYD DIFFERENTIAL AREA (HYD DIFF)

ance welding manufacturers, and tubing and fitting manufacturers.

The symbols which were devised for the complete line of fluid power components (reproduced in this article) are especially helpful in following the flow in a circuit. The maintenance man can easily trace the flow of fluid through the valves without referring to the valve manufacturers' catalogs. He merely follows the valve symbol layout. This saves much time, especially on complicated layouts. Many machines containing fluid power systems have the circuit diagram attached somewhere on the machine.

The question often arises: Where and to what type of equipment is fluid power applicable? The application of fluid power is limited only by the ingenuity or foresight of the designer, production engineer, and plant engineer. If the application pertains to lifting, pushing, pulling, clamping, tilting, forcing, pressing or any other straight line motion and many rotary motions, it is quite likely that fluid power will meet the requirements. It is difficult to visualize the tremendous part that fluid power is playing in all phases of manufacturing and other industrial processes. Whether it be in our large industries where mass production is a must or in small plants where high efficiency is necessary for survival new uses are being found every day for air and hydraulic systems.

Another question which is often asked is: Why is the use of fluid power becoming so universal? Whether a new piece of equipment is being designed for the plant or an old machine is being reconditioned for mass production, the use of a fluid power system has two distinct advantages.

First, such a piece of equipment can be operated with very little

"Boy, that scared me! For a minute I thought it was my wife!"

effort and motion on the part of the operator. The fluid power controls can be placed in a central station so the operator has complete control of the entire machine at all times. If a multiple operation machine or a group of machines is used in the manufacturing process, the operator at one central point can control the whole process. This is prevalent in the steel mill industry where an operator sits in a pulpit and can control all the movements of the mill. The fluid power controls may control motions several hundred feet away from the operating stations with precise accuracy.

A good example of reducing operator fatigue can be seen on chucking machines. When an operator is chucking large work pieces, such as a casting, he will experience considerable fatigue at the end of an eight hour shift if he wrestles a big chuck wrench all day long. With power chucking, merely a flick of the wrist or the movement of his foot gives full gripping pressure at once.

In conversing with time study men, they point out that there is a considerable difference in efficieny of production on hand chucking machines and power chucking machines due to operator fatigue. Another thing that must be taken into consideration is that many plants are hiring women operators and these women cannot handle big heavy chuck wrenches efficiently.

Second, a fluid power system will give flexibility in the equipment without complex mechanisms. By merely adjusting a small flow control valve a large variation of speeds and feeds may be obtained. If a number of different pressures is required on a piece of equipment this can easily be accommodated by the use of pressure relief valves or pressure reducing valves. If skip feed is a desirable feature, a cam operated flow control valve may be added to the circuit and can be controlled by cams or trips on the machine table. It is difficult to visualize the great possibilities actually afforded by the combination of various fluid power components. The important thing is that with all of this flexibility, the cost is relatively small.

Still another question which is often asked is: Which of the fluid powers should be used in an application? There is no hard and fast rule to follow but a good general rule is: If the application requires a great amount of pressure or an extremely accurate feed, use an oil hydraulic system; but if the application requires only a medium amount of pressure and a good accurate feed, use a combination of air and hydraulic; or if the application requires speed, a medium amount of pressure and only a fairly accurate feed, use an air system.

Of course, there are other things to take into consideration when selecting the proper medium for the

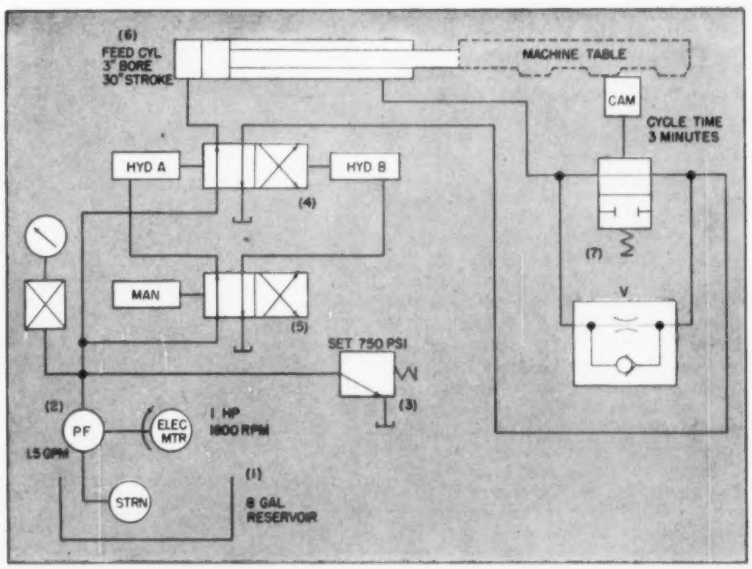


Fig. 2. In the first operation, (1) Operator places workpiece on machine table which has magnetic chuck. (2) Then operator shifts handle of manual pilot control valve #5, causing oil to flow to hydraulic connection A on pilot-operated master control valve #4. Piston shifts, allowing oil to flow to blind end of feed cylinder #6. (3) The feed cylinder piston rod moves machine table forward at rapid rate until cam on feed table contacts cam roller of cam-operated speed control valve #7. As cam roller is depressed, exhaust oil flow is shut off and meters through speed control portion at a speed determined by needle setting. Each time roller rides off cam, the cylinder operates at full speed. (4) When piston rod of cylinder #6 reaches end of stroke, operator shifts handle of valve #5, allowing oil to flow to hydraulic connection B on valve #4 which shifts, sending oil to rod end of cylinder #6, whereupon piston and rod retract table at rapid rate. (5) Operator unloads workpiece, reloads for next operation

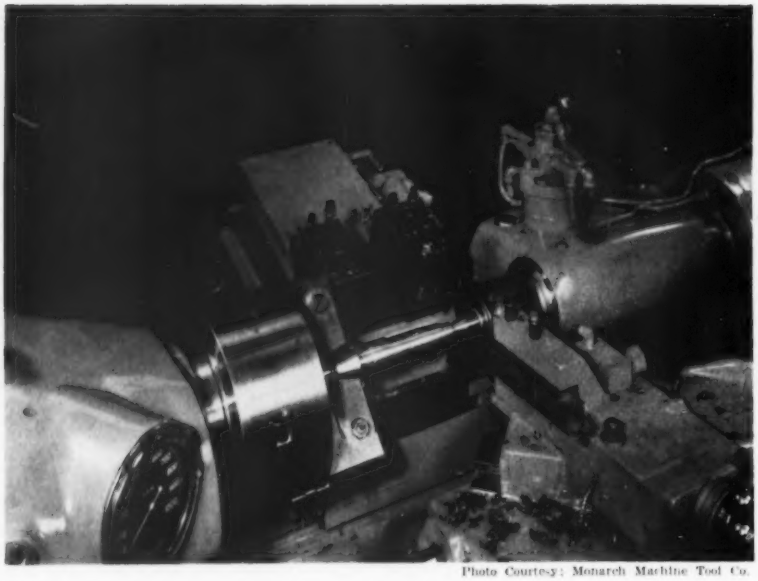


Photo Courtesy: Monarch Machine Tool Co.

Fig. 3. This air operated chucking equipment is just one example of the many ways in which fluid power can improve production in many types of plants

motivating force. First, if air is being considered it must be determined whether there is enough air compressor capacity available to handle the added air equipment. A good many plants today have added so many air operated devices that their compressor capacity is woefully inadequate. Often at the beginning of a shift when all of the air devices are started at once the pressure drops to such an extent that air clamping devices will not properly hold their workpieces. The addition of surge tanks near the machine with multiple air devices often helps overcome some of the difficulty but it is usually necessary to make provisions for more compressor capacity.

Second, the location of the equipment has much to do with the selection of the fluid medium. For example, if the equipment is subject to severe weather conditions such as lifts on a loading dock where the temperature may range from 110 F to -20 F, an oil hydraulic system is usually preferred. If air is used and the weather becomes extremely cold, condensation in the lines would freeze and make the system inoperative. In extremely hot locations it is sometimes better to use an air system.

Third, it is well to consider the packaged unit. The present day trend is to eliminate central power stations wherever possible. A pretty good example of this, although not in the category of fluid power, is the obsolescence of overhead line shafts. In the early part of the Twentieth Century in many plants and today in a few small plants, one would find an overhead line shaft running from one end of the plant to the other and operated from this line shaft would be lathes, planes, drill presses, grinders, etc. If the large electric motor at the end of the line shaft failed the complete line would be down.

Today with production at a premium the trend is toward the packaged unit. By using a packaged hydraulic power unit to operate one machine or one group of machines, a failure in one unit will not effect the production of the entire plant. Standby units are usually on hand in the maintenance department in order to get this one machine back into operation with very little delay. Some machine tools are equipped with portable, packaged electric hydraulic power devices. Quick disconnect fittings are valuable on portable devices inasmuch as they eliminate the spilling of oil on the floor when the change is made.

Yet, another question that is often brought up by those who have had little experience with fluid power systems is: Is it expensive to maintain fluid power systems? By employing a system of simple preventive maintenance, fluid power systems need very little attention and will give years of satisfactory service. By the very nature of the oil hydraulic system, the moving parts of the components are working in oil. As long as the oil is kept clean and free of condensation the operating conditions are ideal.

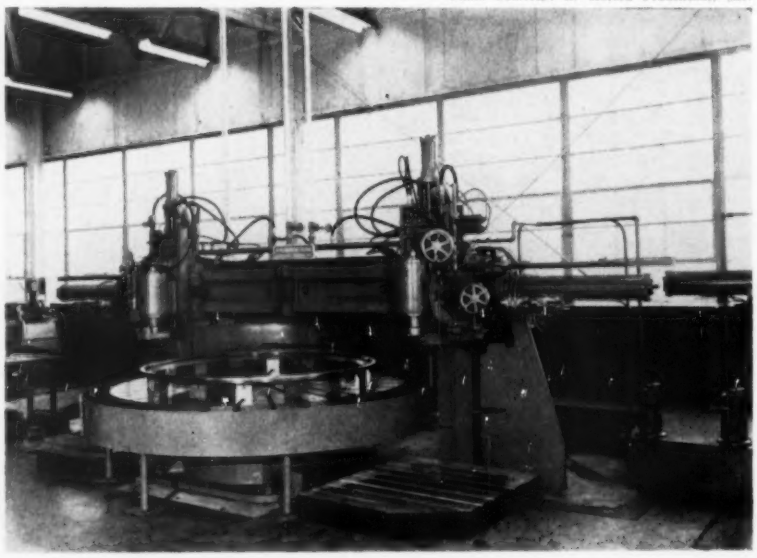
In air systems the air must be kept clean and lubricated for peak efficiency. There are many cases where fluid power systems have been in constant operation for 10, 15, and 20 years and maintenance on valves, cylinders, and power units has been amazingly small.

If good equipment is purchased the user can be sure of satisfactory service. One thing the user should keep in mind, however, is that he should be able to get service on his equipment when he needs it. He should also keep a few parts on hand such as piston packing, rod backing, gaskets, and piston rings, for any emergency that might arise from everyday operations.

Fluid power systems are now being used in applications today that would not have seemed possible a few years ago. The future of fluid power is unlimited. We have only scratched the surface of possibilities where fluid power systems will be the answer to production problems.

Fig. 4. This grinding machine is equipped with an oil hydraulic system. Note the large amount of hydraulic components which are used on this machine

Photo Courtesy: A. Harold Frauenthal, Inc.



The first step in raising slabs is to drill 2 in. openings through depressed concrete slabs on roadways and walks

Next, cement, top soil and water are mixed to make a mud. Mud is used since concrete couldn't be forced into the areas

Mud-Jack Method Raises Depressed Concrete Slabs

HAVE YOU TRIED the mud-jack method of raising depressed sections of roadways and walks in your plant? Western Electric Co. is using this method at their Hawthorne Works, Chicago, Illinois, and find it very satisfactory. This method is also very economical since it eliminates extensive reconstruction.

The first step in raising the concrete sections is to drill 2 in. openings through the depressed slabs. After this is done, cement, top soil and water are mixed together to make a mud.

The mixture of mud is then pumped into the sub-grade through the slab-openings with a mud-jack. Mud is used rather than concrete because it was difficult to force concrete into the sub-grade areas.

After the mud is poured, wooden plugs are inserted into the holes until the mud sets. When the mud has set, the holes are filled with concrete to complete the job.

The grout intrusion method has long been used successfully in making repairs to foundations, concrete structures and even dams. Its great advantage lies in the fact that this method obviates, in many cases, extensive construction work. It can best be applied when the structure is basically sound.

The mud is pumped into the sub-grade through slab openings by mud-jack. Openings are plugged until mud sets

These men check raised portion of concrete slab. Reconstruction is thus eliminated by the use of the mud-jack method

Special Pinch Valve Controls Flow of Granular Material

An employee suggestion of a positive pinch control valve has proven very successful for controlling the flow of granular material . . . Because of its accurate operation, low initial cost, it has replaced valve formerly used

ANY PLANT THAT handles granular materials knows that there are difficulties in the regular control of the flow of such materials. This is generally true when the materials are of an abrasive nature. Many types of controls have been used with varying degrees of success.

One such control, the positive pinch valve, which was suggested by Albert Creekmore, an employee of the Carborundum Co., Niagara Falls, New York, has proven very successful.

However, before the company adopted his idea, they were using a gate type control with a slide opening, recessed in a metal chamber. This slide could be regulated so that it would stop the flow of grain through the system. It also was used at the outlet for packaging purposes.

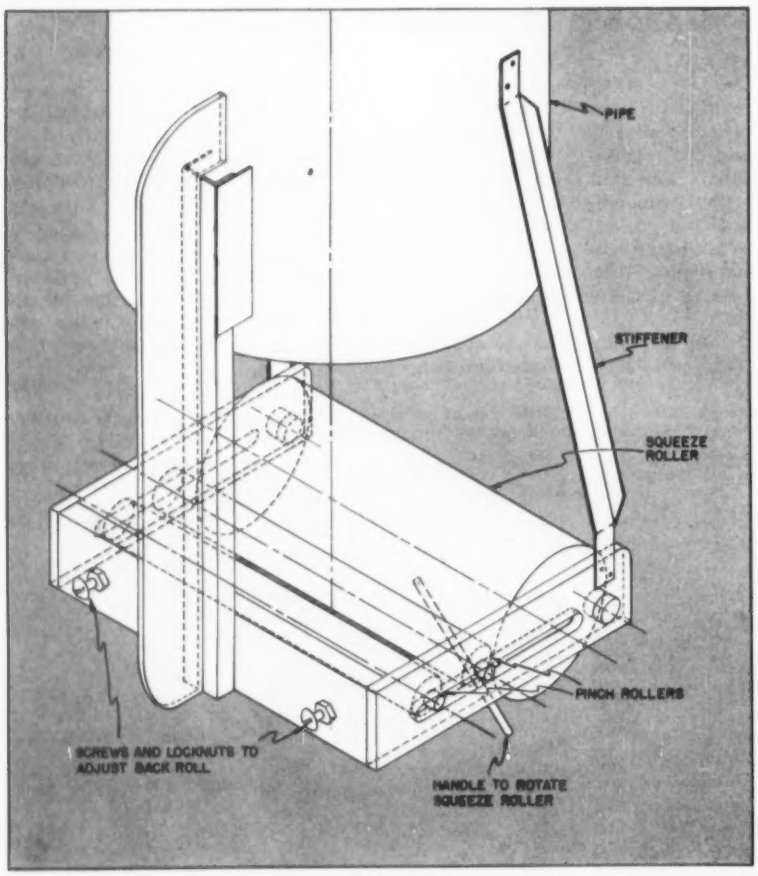
But the gate control did not work as efficiently as the company had hoped. It was necessary to have the parts precisely machined and fitted. This resulted in a high original cost. In addition to this, the cost for maintenance was also high because of the gradual wear from the abrasive materials. The company could not rely on the gate control to operate properly at all times. Occasionally, particles would get wedged between the slide and runners, allowing grain to dribble through.

The positive pinch control valve suggested solves these problems. This valve replaces the old type slide valve and consists of a rubber hose which clamps onto a 4 in. pipe and passes between two small free rollers, which may be adjusted to suit the hose.

An eccentric roller (see sketch) can be added to the unit to provide positive setting. The valve may be operated manually or an electric eye mechanism can be installed to make it automatic. The two small free rollers at the pinch permit closure without dribble. As the pinch tightens, it cuts off the flow of granular material and the load above the pinch is raised because of the resiliency of the rubber and the independent action of the rollers.

The original cost for such a valve and its maintenance are low. The life of the one part exposed to wear is longer and requires only infrequent replacement. The control is positive as there is no wear in the line of flow that will change the orifice. This new valve is particularly valuable when used to control the flow of materials to a container set on a scale for exact weight.

So great have been the savings from the new type valve control that the suggestion is being reviewed for an additional award, in keeping with the savings which have been realized from the suggestion.



Sketch of the positive pinch control valve which was suggested to improve the flow control of granular materials. A rubber hose clamps onto the pipe and passes between the two small free rollers which may be adjusted to suit the hose. The squeeze roller provides positive setting for varying valve opening

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—Editors

WHERE TO BUY
CHESTERTON PACKINGS

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Turner Sup. Co., Mobile
Wimberly & Thomas, Birmingham

Arizona
Geo. S. Thomson, Phoenix

Arkansas
A. S. Kelly, West Helena
McKee-Pitts, Fort Smith

California
Mission Pipe & Sup. San Diego
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Holz Tire & Rub., Lodi
Valley Pipe & Sup., Fresno
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Colorado
Chas. A. Schieren, Denv.

Connecticut
Lindquist Hdw., Brid'p'rt
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Illinois
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Indiana
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Smith-Monroe, S. Bend

Kentucky
Louisville Mill Co., Louisville

Louisiana
Paul, Rice & Levy, New Orleans
Service to Sawmillers, Shreveport

Maine
Hall & Knight, Lewiston

Massachusetts
Fall River Steam & Gas Pipe, Fall River
Holyoke Valve & Hydrant, Holyoke
Industrial Sup., Worc.
Robbins-Gamwell, Pittsf'ld
Zina Goodell, Salem
Albert E. Mayer, Springfield

Michigan
Northern Hdw., Menominee
Kenneth Anderson, Detr.

Minnesota
Goodin Co., Minneapolis
Du'uth Plumbing, Du.uth

Mississippi
John S. Stilley, Jackson

Missouri
Kansas City Rub. & Belt., Kansas City
Rubber Prod. Co., St. Louis

Nebraska
Interstate Mch. & Sup., Omaha

Nevada
Sierra Mch., Reno

New Jersey
Fleck Co., Camden
Mfg. Selling, Trenton

New York
Kasper & Koetzle, Br'klyn
Root, Neal & Co., Buffalo
Burns Piping, Syracuse
Baltran Assoc., N.Y.C.
Colerick Sup., Utica
Geo. H. Cole, Troy

North Carolina
Bernhardt-Seagle, Lenoir
Gen. Fdy. & Mch., Sanford
Sykes Sup. Co., Burl.
A. Lynn Thomas, Charlotte & Raleigh
Cape Fear Sup., Fayetteville

Ohio
Clark Asbestos, Clev.
Shaw-Kendall Eng., Toledo
Yohe Sup., Canton
Monarch Petr. Prod., Columbus
Focke Rub. Pro., Dayton

Oklahoma
Hart Ind. Sup., Okl. City

Oregon
Ken McDowell Co., Portland

Pennsylvania
M. S. Young, Allentown
Perry Mill, Erie
Raub Sup. Co., Harr'sburg & Lancaster
E. Keeler Co., Will'sport
Bush-Miller, York
Somers, Fitler & Todd, Pittsburgh

S. Carolina
Sullivan Hdw., Anderson
Allen & Webb, Charleston
A. Lynn Thomas, Columbia

Tennessee
Nashville Mch. & Sup., Nashville
Browning Belt. & Sup., Knoxville
Pidgeon-Thomas Iron, Memphis
Rogers-Bailey Sup. Chatt.
Summers Hdw. & Sup., Johnson City

Texas
Zork Hdw., El Paso
Hornsby Heavy Hdw. Wichita Falls
Conroe Mill Sup., Conroe

Utah
Chas. A. Schieren, Salt Lake

Virginia
Barker-Jennings, Lynchburg
A. Lynn Thomas, Richmond & Norfolk

Washington
Titan Chain Saw, Seattle
Jensen-Byrd, Spokane
Paramount Sup., Tacoma

Wisconsin
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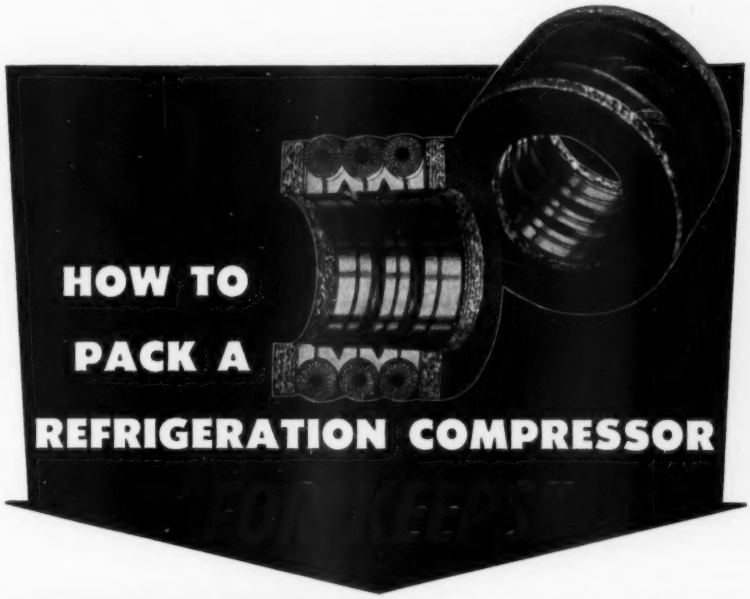
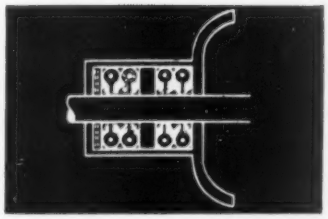
6 Ashland St., Everett 49, Mass.
AMERICA'S OLDEST MANUFACTURER OF MECHANICAL PACKINGS

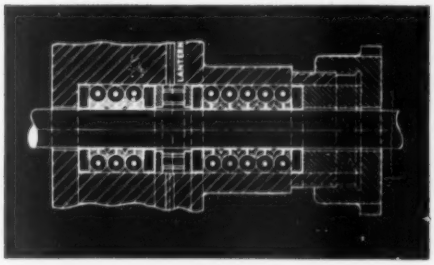
Chesterton 444





Chesterton 444 is full metallic on rod or shaft. It runs frictionless without usual gland pressure. Why? It's due to E-L-A-S-T-I-C back and *built-in oil seal* in each Metallic ring. These special metal rings are soft enough to machine themselves to rod imperfections. 8 to 10 years uninterrupted service is common with Chesterton 444.

Chesterton 444, formerly Austin-Mason, is the most famous name in refrigeration packing. Easy to install — each ring is cut so it may be opened to fit over rod or shaft. Full directions accompany every set. Unexcelled for Ammonia, Freon, CO_2, steam, brine, air and other liquids and gases.



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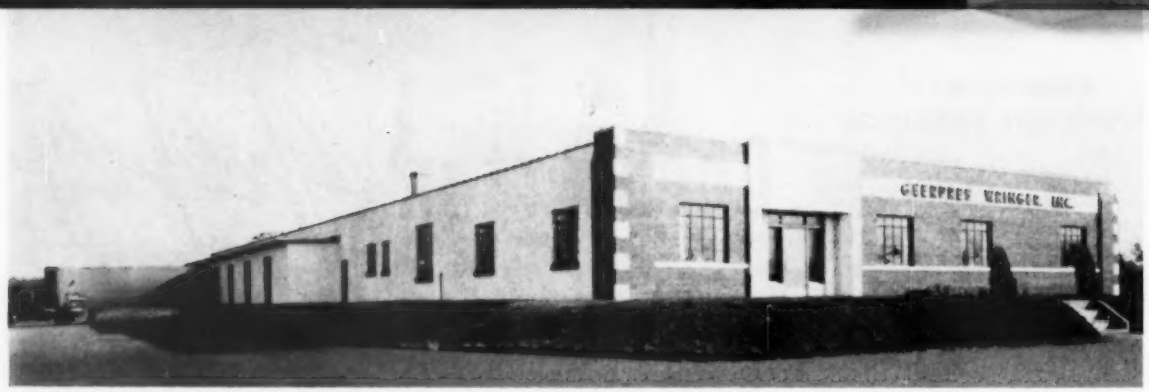


New Geerpres Wringer plant features multiple truck loading dock, delivery ramp into plant, and 400-ft railroad siding

Small Plant . . . Big Handling Ideas

THE NEW PLANT of Geerpres Wringer, Inc., in Muskegon, Michigan, was built with an eye toward handling their product in process, with the least effort.

Manufacturers of industrial mop wringers, Geerpres assembles the wringer and attaches it to a bucket which is delivered to the plant, fabricated and galvanized.

The unloading of these buckets presented the first opportunity to use power handling. The use of a power-driven conveyor belt to unload the rail cars has proved of great value. The end of the conveyor is set directly into the car on the siding, to minimize the travel of the man unloading the car.

The next step in the process was designed to further ease the handling of buckets through the plant. The first stop for the newly-received buckets is for the attachment of a 4-armed spider on the bucket bottom, with a caster on each arm. Completing this step near the receiving dock permits the use of the casters themselves as materials handling aids during further manufacturing steps.

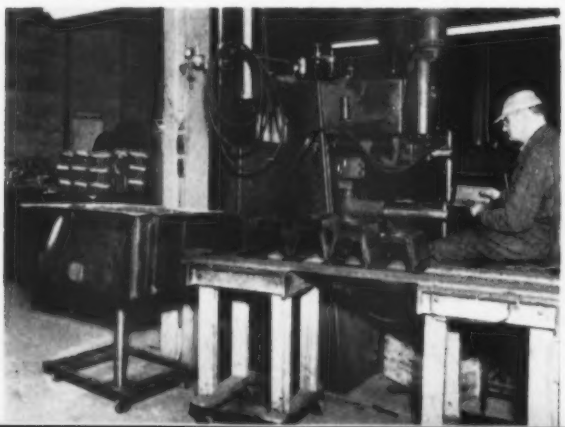
At one point in the assembly, a spotwelding operation secures a shaft to the wringer compartment, before it is installed in a bucket. At this machine, a hydraulic lift (one of several similar installations throughout the plant) raises tote boxes of parts up to work bench level, to speed the unloading of the boxes at the work station. The tote box is rolled over the lift on a castered dolly, through which the lift rises as the box is lifted.

After assembly is complete and the wringers are packaged, the cartons are placed on sectionalized wheeled floor conveyor sections, for transportation to the loading dock. These conveyors can be extended or shortened by addition or removal of lengths of conveyor, depending upon the size of the load to be transported to the dock.

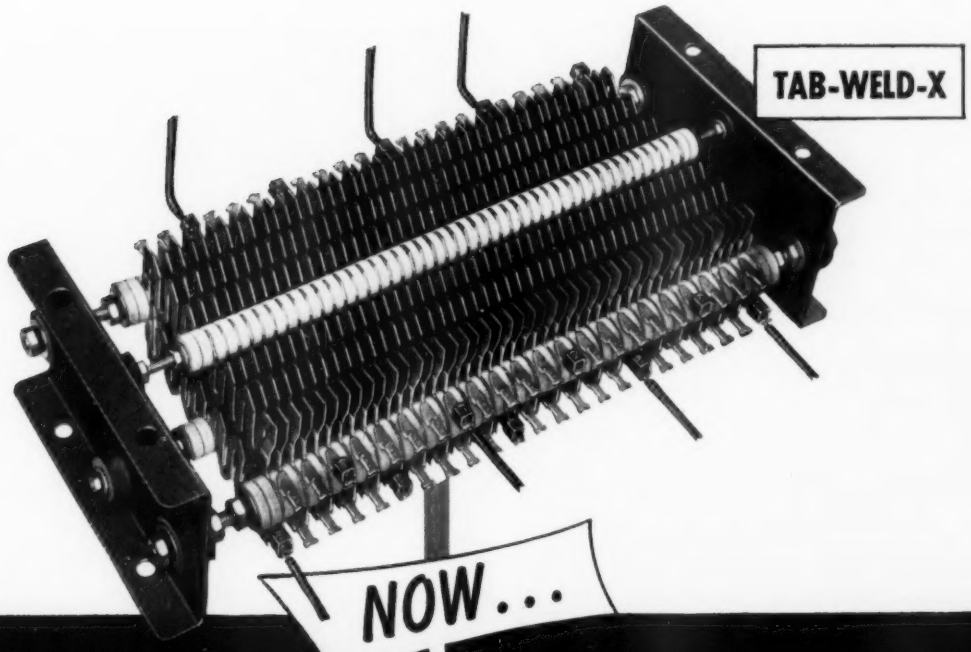
Portable belt conveyor extends into car for unloading buckets

Casters on buckets provide materials handling function

Parts rise to work level on 1000-lb capacity hydraulic lift



Sectionalized wheeled floor conveyors move packaged units



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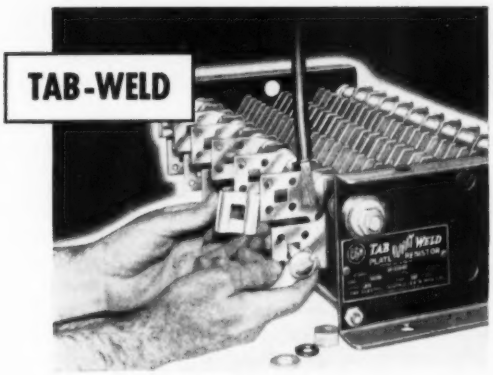

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EC&M TAB-WELD RESISTORS

No Crowding . . . 3/8" to 3/4" spacing between grids in EC&M Types TW and TW-X Sections

In both styles of EC&M Welded Plate Resistor Sections, heat radiation is *efficient*. Spacing between grids is a minimum of 3/8" on the smallest grid size up to a 3/4" maximum on the 150-ampere continuous capacity section.

Likewise efficiently designed are the individual grids, resulting in completely covering a plant's requirements with a *minimum* of sizes.

Remember, also, these EC&M TAB-WELD Resistors may be used "off-the-storeroom shelf." Many taps make on-the-job connections easy and readily permit small adjustments in resistance-value.

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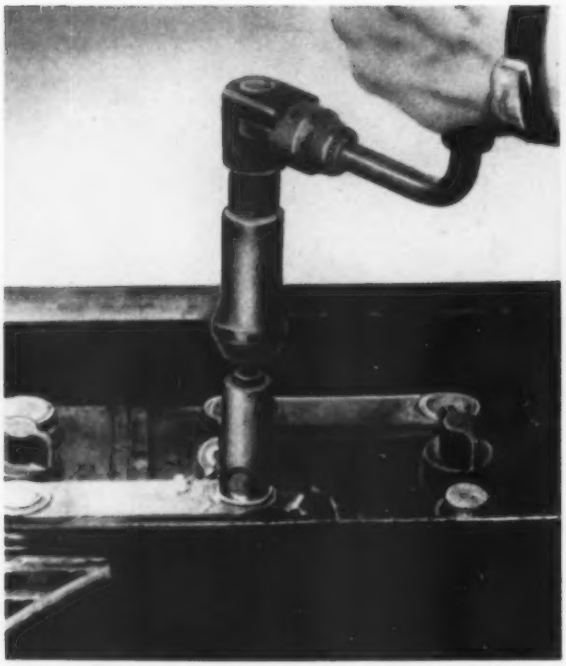


Fig. 1. Drilling an annular hole with a specially-developed tool. The tool permits cell connectors and jar covers to be removed without disturbing the terminal post in any way

Fig. 2. Method shown at the left isn't the only way to do the job. Here is an alternate method of drilling posts to remove damaged cover. It involves use of 15/16 in. drill

When They're Damaged, Here's How to

REPLACE BATTERY COVERS

Fig. 3. Pulling the cover and element of a battery simultaneously is a technique useful when the cover is not damaged. Note the hold-down clips at the side of the battery

Instructions given for simple procedure used in removing battery covers for cell replacement . . . Special tools have been developed to aid the maintenance man

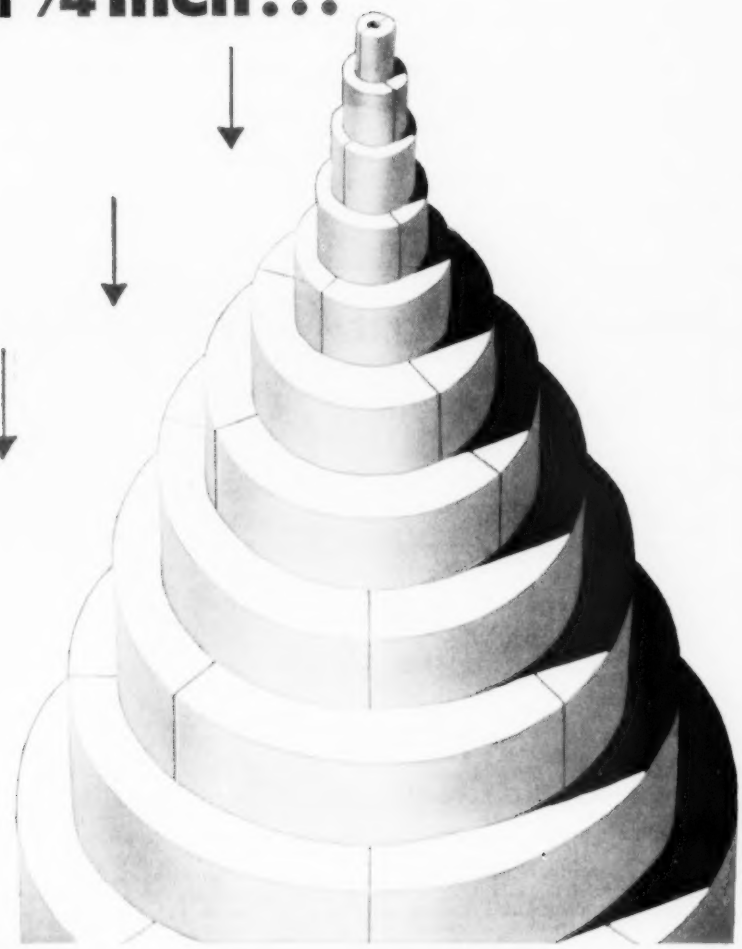
TO EXTEND THE LIFE of an industrial truck storage battery that has been accidentally damaged, it is often necessary to remove its cover for cell replacement or element repair. Though simple, the procedure is not widely understood, and the following instructions from the Service Department of Gould-National Batteries, Inc. are worth filing in your folder of battery maintenance and repair trucks, and discussing with your shop men.

Because the covers of rubber-jar batteries have post openings which are lined with lead inserts integral with the hard rubber cover and because these lead inserts or linings are welded to the lead battery posts to prevent leaks, it is necessary to drill out gaps between posts and inserts in order to remove a damaged cover.

A special drill has been devised by Gould-National engineers which cuts an annular hole, as shown in Fig. 1, and permits the lead posts to remain solid, upright and of normal height after the cell connector and the jar cover have been separated.

The other technique is to drill the posts in the damaged cover to a depth of $\frac{3}{8}$ in. using a 15/16-in. drill, as in Fig. 2. This frees the inter-cell connector. Such drilling may then be continued through the cover to free it in turn. This latter technique requires rebuilding the

For Radii from ¼ Inch...



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The complete range of Kaylo Insulation includes pipe covering in Simplified Dimensional Standards for diameters from ¼ in. to 72 in., curved block from 72 in. to 60 ft. and flat block for surfaces of less curvature whose radii approach infinity. With its wide selection of interchangeable sizes and shapes, Kaylo Insulation reduces the number of items needed per job and permits substantial savings in warehousing maintenance stock.

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posts before reassembly in a new cover to replace the broken one. Such rebuilding is done by a simple lead "puddling," applying heat by a carbon electrode manipulated within the cavity of a simple post mold. Post molds are available as purchased items if the maintenance man does not care to make his own.

In the case of certain battery designs there is sufficient clearance between the inter-cell connector and the top of the cover so that the first drilling may be eliminated by a horizontal saw cut under the connector.

In cases where the cover is not damaged, but both cover and elements are to be withdrawn from the jar for basic cell repair, it is only necessary to remove the inter-cell connector and lift both cover and elements as a unit, Fig. 3. Note the jar hold-down clips to which the chains are attached.

The chains may be stepped upon by the repair man as the cover and elements are lifted. The lifting tool in this case is a post cutter with its cutting edges dulled. During such a repair it is not even necessary to remove the inter-cell connector from the post to which it is welded if a mere saw cut through the connector (immediately above the line of junction between the bad cell and its neighbor) is permissible.

New Light on Gas Venting

VENTING OF GAS appliances finally has been placed on a sound basis. This development, of vast importance to the gas industry and the heating business, is the result of extensive engineering research recently completed by William Wallace Company with the help of the Stanford Research Institute. The effect of this work will, in time, bring about standardization of code regulations and simplify the work of installers.

In the early days of gas heating, "out of sight" was "out of mind" with respect to the invisible products of combustion of gas-burning equipment. Many appliances were installed in the belief that any type of passageway from the appliance to the outdoors was adequate. In time, of course, rusted or crumbling vent pipes, damaged walls and discolored furnishings brought about realization that gas venting was a more complex matter than building a chimney for a fireplace.

In the engineering research recently completed, fundamentals governing venting were determined and then experimental work was performed to verify these laws and evaluate any unknowns involved. The first step in this work was a study of the underlying factors involved in venting. From accepted physical laws it is known that vent gases flow through and up a vent because they are hotter—and hence lighter—than the ambient air. The hotter they are in relation to the ambient air, the faster they will flow.

Hence, it is obvious that the heat content of the flue gases represents the available power to operate the vent. It follows then that the first requirement of a vent is to conserve this available power throughout the length of the vent—in other words, to keep the vent gases hot. In the work performed, these fundamentals were expressed in a mathematical equation and tested by experiments with actual vent installations.

Among other things, the findings showed that, for a vent of given dimensions and resistance, any increase in heat loss will cause a corresponding decrease in the average temperature of the vent gases and hence in the "power" of the vent to operate. While this should be a self-evident fact, it apparently has not been given much weight to judge by the kinds of vent pipe materials still in common use.

No one questions the necessity of insulating steam lines or hot air ducts —few people seem to realize that gas vents must be insulated for the same reason. The explanation is that, until now, the function of the vent gas temperature was not fully understood nor was the importance of conserving the heat content of the flue gases fully appreciated.

The effect of these findings on existing vent practices may change many long-held concepts. For example, under certain conditions, it may be necessary to reduce the diameter of the vent to a size smaller than that of the vent collar. Practically all codes prohibit such a reduction in size, thereby making it impossible to install a proper vent under certain conditions.

Most codes require that a lateral run have an upward slope of ¼ in. per foot, while laterals in enclosed overhead spaces are required to slope upward at least 45 deg. Actually, there is no scientific basis for this requirement—if the vent is run vertically a foot or more up from the appliance (to offset the inertia of gas flow) a perfectly horizontal vent will not affect vent operation.

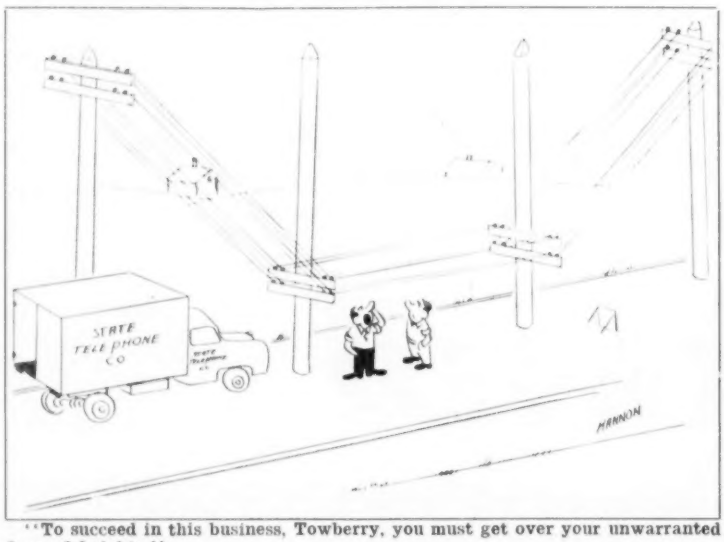
Many codes require that when two vents are connected to a common vertical vent they must intersect at an angle of not greater than 45 deg. This is another restriction with no sound basis for its existence. Strangely enough, most codes permit the common practice of running a single wall, uninsulated pipe lateral from the appliance to an insulated vertical vent. This, of course, allows a substantial loss of heat before the gases reach the vertical run and wastes a good portion of the "power" available to make the vent operate.

Probably one of the most harmful code restrictions is that which requires use of a tee at the bottom of the vertical vent where the connection is made to the lateral from the appliance.

This tee involves, with the one to three elbows required, a considerable increase in resistance, and serious spillage at the draft hood might occur.

These examples of incorrect venting practices indicate the urgent need for prompt revision of many present code regulations and installing practices.

These new rules for gas venting, together with complete tables of vent capacities required under given conditions, are about to be published in a convenient handbook being prepared by William Wallace Company. Copies may be obtained, without charge, by writing to the company at Belmont, California.



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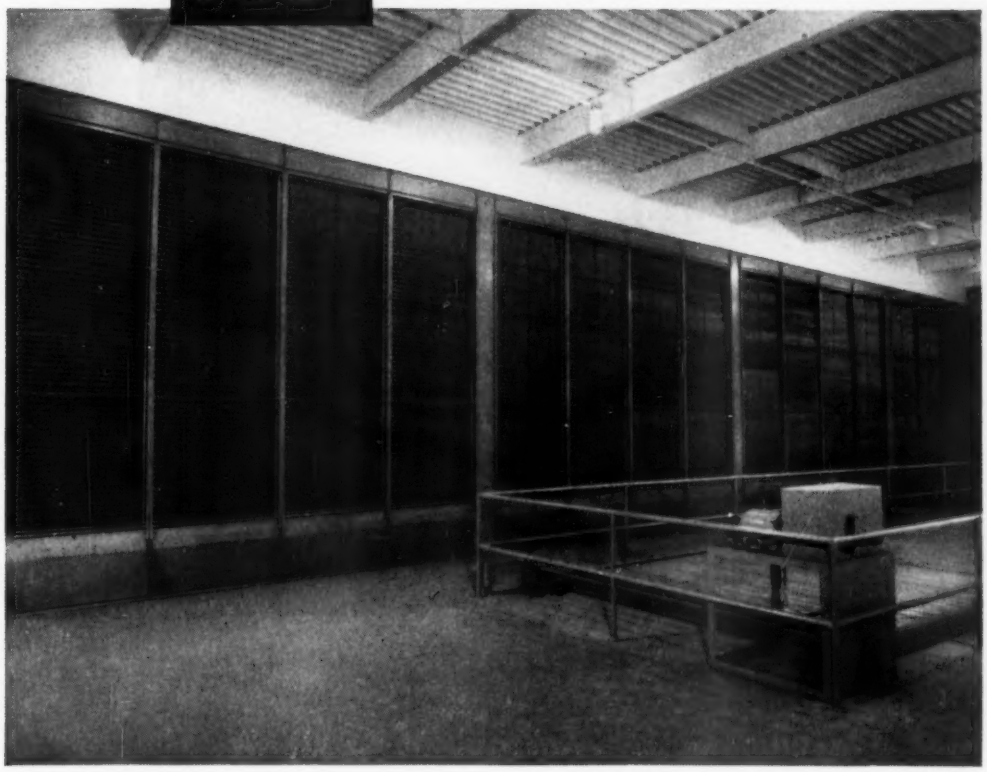
only AAF makes the complete line



*AAF MULTI-DUTY—the above photo shows a rear view of part of a big installation which provides clean air for testing Jet Engines. This unit, the most widely used automatic air cleaner in the world, features overlapping panel construction.

The MULTI-DUTY's positive self-cleaning principle assures continuous operation with minimum maintenance. AAF manufactures four other types of viscous filters which utilize every known method of maintenance. And remember—AAF is the only complete line.

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Why 5 types* of viscous air filters?

It's a good question! Since other companies only make *one* or *two* types! However the answer makes sense to engineers. AAF's five distinct types offer the needed latitude in specifying the right filter for a specific job without a compromise! Following are the five types of AAF viscous impingement filters:

- MULTI-DUTY — permanent self-cleaning, fully automatic filter with exclusive overlapping panel construction.
- M/W Unit — washable filter for heavy industrial service.
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Here's an Anti-Swing Crane

Among the marvelous developments at Argonne National Laboratories is this anti-swing, anti-creep crane . . . Swing of the load has been controlled much more closely than formerly possible with even the most skilled operators

AN ANTI-SWING crane with anti-creep variable speed hoisting has been developed by engineers of the Remote Control Engineering Division of Argonne National Laboratory.

The new development, which was conceived by Associate Division Director Raymond C. Goertz, offers promise of increased safety and accuracy in materials handling. In a laboratory model of the crane (see Fig. 1), pendulum-like swinging of the hook and load has been reduced to a minimum while vertical creeping of the load has been completely eliminated. With this type of crane control, radioactive and/or thermally hot materials can be transported without the necessity of having personnel to guide and steady the hook and load.

In normal crane operations, the following takes place: the crane with its load begins to move in a horizontal direction. As the movement starts, the load being carried on the hook tends to swing in the opposite direction. When the crane has reached its destination and is stopped, the load, now possessing momentum, continues its movement in the direction in which it has just traveled. When it has swung as far as possible, the load returns to the vertical position and then swings in the opposite direction. This pendulous swinging continues for some time. Skilled crane operators can, however, reduce the magnitude of the swing by maneuvering the crane carriage.

In the Argonne-developed model, the normal carriage drive has been replaced with a servomechanism which moves the carriage in accordance with electrical signals. In operation the following happens: the crane operator determines the direction in which he wishes the crane to travel and turns a control knob on the instrument panel.

The crane automatically moves in the direction chosen and while doing so, transmits electrical signals to the servomechanism regarding its position, speed of movement, and amount of swing of its load. The servomechanism adds these positive and negative signals to that which was placed into the servomechanism when the crane operator turned the control knob. A summation of the signals equalling zero means that the crane has reached its desired position. Deviations from a total of zero cause the crane carriage to move forward or backward as indicated diagrammatically in Fig. 2.

An electrical signal which indicates the degree of swing of the load causes a slight movement of the crane's carriage in the direction of the swing. This action allows the load to dissipate its oscillatory energy into the carriage and, as a result, the load stops swinging within one or two cycles.

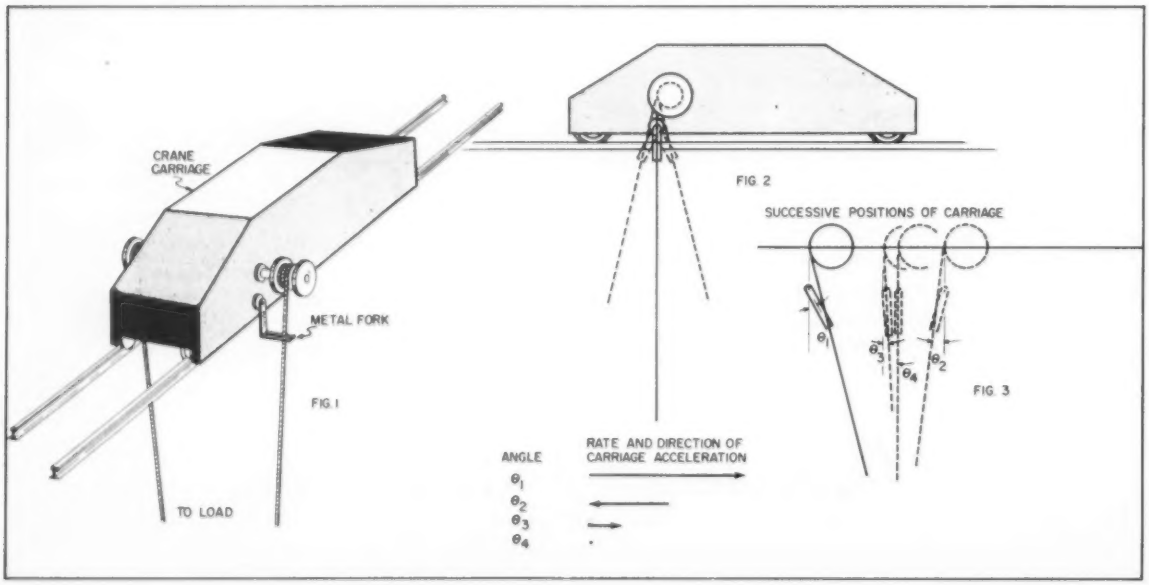
The crane is also equipped with a continuously variable speed drive for hoisting operations. This assures smoother and more accurate vertical control of the load than is possible with conventional cranes.

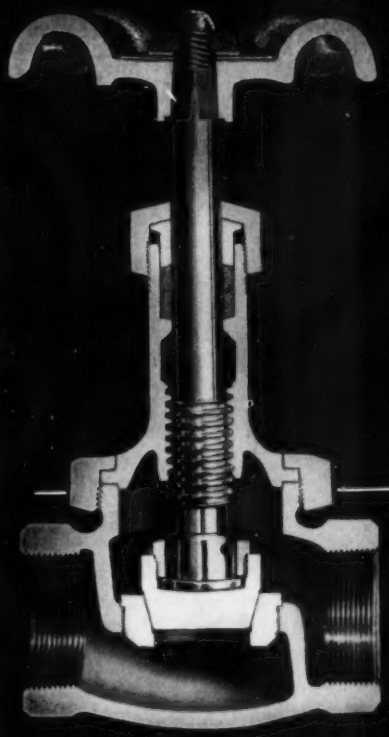
Crane Makers Interested?

Dr. Harvard L. Hull, Director of the Division, in commenting on the new crane stated as follows: "A crane of this type should prove to be of great value to those industries and operations in which materials handling is a prime concern. It has been developed to the extent that interested industrial firms should be able to carry this program further and to perfect a very good full-scale crane embodying the unique features of this model. We hope that industry will avail itself of this opportunity."

Interested manufacturers should contact Dr. Hull, or Lester C. Furney, Assistant to the Director, P.O. Box 299, Lemont, Ill.—Editor.

Fig. 1. This schematic of the model shows the fork which carries the message to the crane-positioning servomechanism
Fig. 2. How the crane is positioned to allow the load to dissipate its energy into the carriage and thus stop the load swing





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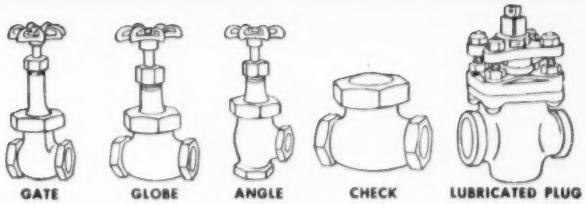
COMPLETE LINES OF BRONZE VALVES AND PIPE FITTINGS are manufactured by Walworth in a variety of types, pressure ratings, sizes, and patterns, including Walseal® Bronze Valves and Fittings for making Silbraz® joints.

Walworth also manufactures complete lines of valves and fittings — including Lubricated Plug Valves — made of steel, iron, and special alloys as well as bronze.

Walworth-made valves, pipe fittings, and pipe wrenches, total approximately 50,000 items—all sold through distributors in principal centers throughout the world.

Walworth engineers will be glad to help you with your problems. For full information call your local Walworth distributor, nearest Walworth sales office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Bronze valves in gate, globe, angle, check, and lubricated plug types are manufactured by Walworth. Illustrated is a sectional view of a Walworth No. 225P Bronze Globe Valve. This valve has a working steam pressure rating of 350 psi at 550F (1,000 psi non-shock cold water, oil, and gas pressure). It features a renewable, plug type, stainless steel seat and disc, heat treated to 500 Brinell hardness.

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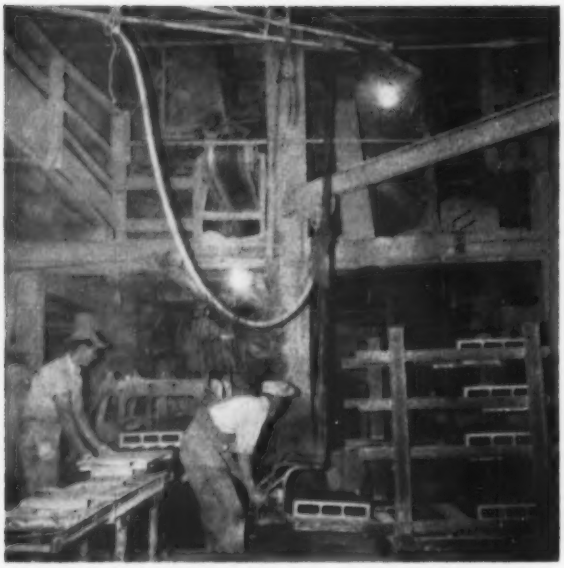

Air hoist is used to set pieces of terra cotta ware, weighing 75 lb each, into dryer racks for removal to drying chambers

With air actuated grab attachment, air hoist handles slabs of building facing. Slabs are ground to size in background

Air Lifts It for Them

Back injuries were numerous with former methods of handling materials . . . The safety department and plant engineering worked together during expansion and modernization program to replace hand-lifting equipment

By JOHN D. FEACK, Plant Engineer, Gladding, McBean & Co., Lincoln, California

AT THE Lincoln, Nebraska plant of Gladding, McBean & Co., manufacturers of structural clay products, the use of the human back as a lifting device has become as outmoded as the the one-horse shay. A program of substituting air power for muscle power has paid big dividends in increased efficiency and safety.

As an expansion and modernization program was being brought to a close in 1948 it was found that most of the operations still in need of improvement involved problems in materials handling. The safety department pointed out that these same operations were the source of nearly all of the back injuries occurring in the plant. It was soon obvious that the answer to both the efficiency and the safey problems was to replace all hand-lifting with fast, efficient air hoists.

The operation which was the worst offender was the first to be tackled. In this operation newly formed pieces of terra cotta ware are taken from the conveyor line and placed in racks for removal to the drying chambers. These pieces weigh 75 lb each and, since they are in a plastic state, must be handled gently. To keep up with the speed of the machine it was necessary to have 4 men, 2 men to a piece, off-bearing the ware. The result was confusion, strained backs, and mashed fingers.

The problem was solved with an air hoist suspended from a swinging boom. The horizontal member of the boom also serves as a track on which the hoist can slide to and fro. Since the piston of the hoist can revolve in the cylinder, the hoist can slide back and forth on the boom, and the boom can swing in a 180 deg arc. The operator has complete freedom of motion in a relatively large area. The controls are mounted on the hand grips of the hoist so the operator has both the vertical and horizontal movement of the hoist under control at all times. With this air hoist, one man is now easily doing a job which formerly required 4 men and there hasn't been an injury in the 4 years the hoist has been in operation.

When It's More Than 6 Ft Up

In situations where it is desired to have a lifting height greater than 6 ft, or to lift weights greater than 100 lb, air motors are used. These are available in capacities ranging from 200 lb to 10 tons and can lift to as great a height as desired. The air motors, because of the speed with which they operate—as much as 50 ft per minute—have been especially useful in replacing slower acting types of mechanical lifting devices.

This type of substitution was of special benefit in the manufacture of telephone conduit, one of the major products of this plant. In producing conduit the pieces are extruded onto pallets, 4 pieces to a pallet. The pallets then move down the conveyor line to the trimming station where the pieces are trimmed and finished and the pallets lifted onto dryer racks.

At the time the "air lift" program was started, the pallets, weighing about 800 lb each, were being lifted onto the racks with a chain hoist. The 2 men performing this operation had to work at top speed to keep the conveyor line clear. A ½ ton capacity air motor was installed in place of the chain hoist. The two-man off-bearing crew now had time on their hands so part of the finishing operation was assigned to them and one man was eliminated from the finishing crew.

Announcing!

New DUNHAM HANDBOOKS on Heating!

These two new Dunham Handbooks on Heating are packed full with valuable "how-to" information. They cover selection, application and installation features of Radiation, Unit Heaters, Vacuum and Condensate Pumps, Heating Specialties and complete Heating Systems.

Dunham 400-page Handbook on Heating is an attractively bound desk reference book designed to solve many of your wet heating system problems. It is especially valuable for architects, heating engineers and for use as a basic school text book.

Dunham 272-page Pocket Manual on Heating furnishes clear, concise answers to many questions on wet heating systems that occur on the job. And this saves you time and money! Pocket Manual is adapted from the 400-page Handbook with emphasis on application and installation information of greatest value to contractors and maintenance men.

Mail coupon *today* to take full advantage of special introductory offer!

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DUNHAM

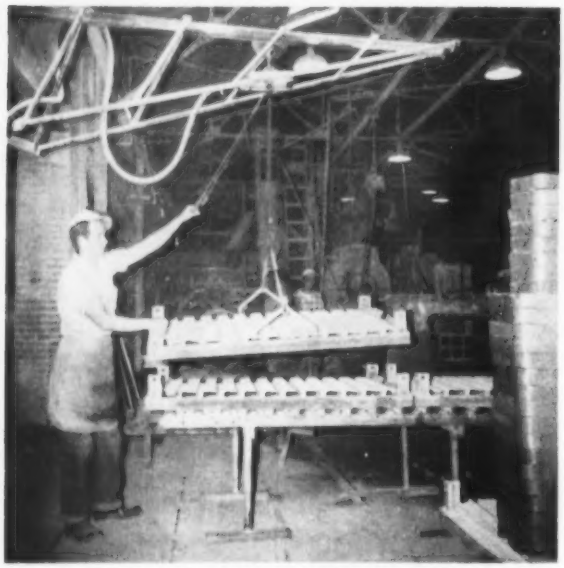
HEATING SYSTEMS AND EQUIPMENT

C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

For more facts circle 563 on Reply Card

Formerly, two men with chain hoist had to work at top speed. With air motor, both men now help on finishing jobs

Dried telephone conduits are set on kiln car with the help of air hoist. Ware is then run through tunnel kiln and fired



Air hoist is also used to lift steel pallets onto conveyor. In 4 years air-handling equipment has lifted over 85,000 tons

The maximum usefulness of air hoists is realized in situations where repeated cycles of lifting take place. This usefulness will not be fully realized, however, unless the mounting of the hoist and the attachment for holding the article to be lifted are adapted to the particular situation. Swinging booms, overhead tracks, and A-frames are among the types of mountings used at this plant. The holding attachments used include forks, hooks, tongs, and air-actuated clamps.

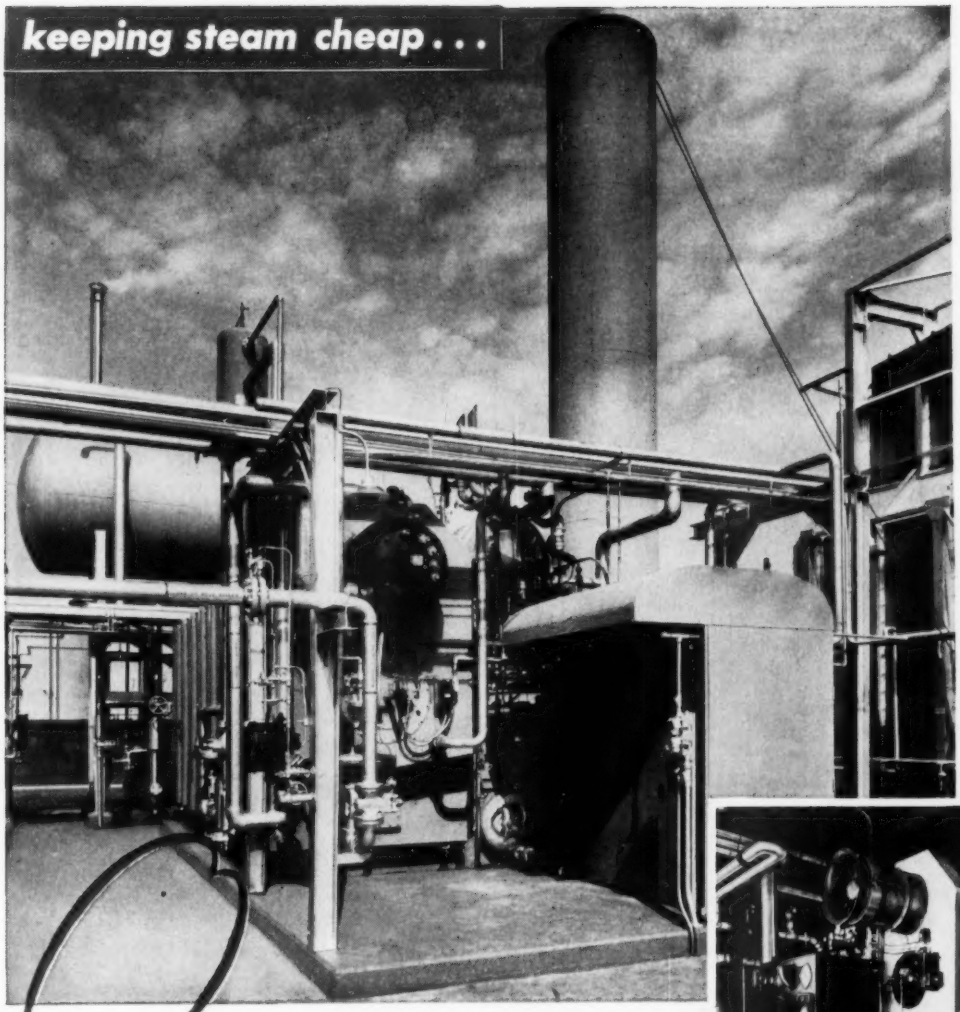
Filter and Lubricate

Air hoists of either the cylinder or motor type will operate day in and day out with a minimum of attention provided the air reaches the inlet at a suitable pressure and has passed through a filter and a lubricator. This principle applies to all air operated tools and must be adhered to in order to obtain trouble-free service. The larger air motors have built-in air filters and lubricators. The smaller ones, because of space limitations, do not. It is essential, therefore, on air cylinders and the smaller air motors to install an air filter and a lubricator in the air line ahead of, and as close as possible to, the hoist. The filter must be drained periodically and the lubricator kept filled with the weight and type of lubricant recommended by the manufacturer.

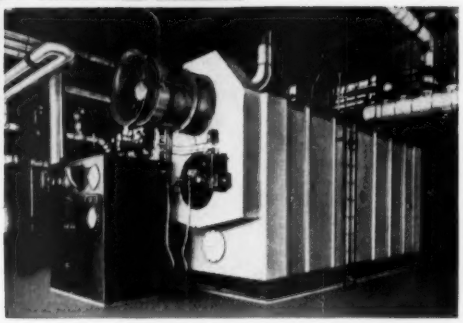
With these simple precautions, long life and freedom from breakdowns are assured for the hoists. At this plant, the various types of air hoists employed have been in service over 4 years without a breakdown. The air hoist mentioned previously has lifted a total of over 15,000 tons, and the air motor over 70,000 tons in the past 4 years and both are still in good condition.

"Frisby, the guy you replaced didn't quit—he was fired!"

keeping steam cheap . . .



Outdoor installation of shop-assembled B&W Integral-Furnace Boiler, Type FM at a large Texas refinery.



Conventional indoor installation uses a minimum of valuable space.

Outdoors as well as indoors
SAVE with the
B&W Integral-Furnace Boiler, Type FM

Outdoor installation of the shop-assembled, *B&W Integral-Furnace Boiler, Type FM,* is an important cost-saving advantage that is gaining wide popularity with users in all sections of the country. A high percentage of units sold to date are for outdoor operation under year-round weather conditions.

A completely water-tight, rigid steel casing encloses the entire boiler and furnace of this compact B&W steam unit. Designed to permit proper expansion and contraction of the unit's various components resulting from seasonal temperature fluctuations, the casing is welded for additional strength and tightness. A blanket of mineral wool plus over-all high-temperature insulation of walls, floor, and roof, minimizes heat loss through radiation.

For installation outdoors or indoors, this versatile, self-contained B&W steam generator is available in steam capacities ranging from 2900 to 28,000 lb per hr, at pressures between 15 and 250 psi. Total steam capacity of units now in service and on order for over 50 different industries, utilities, and other users here and abroad exceeds 5½ million lb per hr.

OTHER COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

BABCOCK & WILCOX

Write for Bulletin G-76, for an illustrated, detailed description of the many other cost-saving features of this unique unit. The Babcock & Wilcox Company, Boiler Division, 161 E. 42nd St., New York 17, N. Y.

G-586

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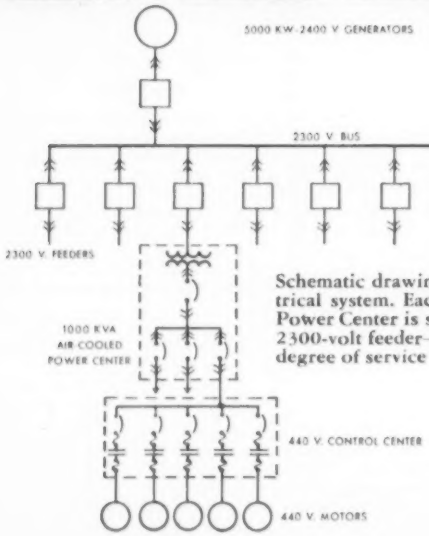
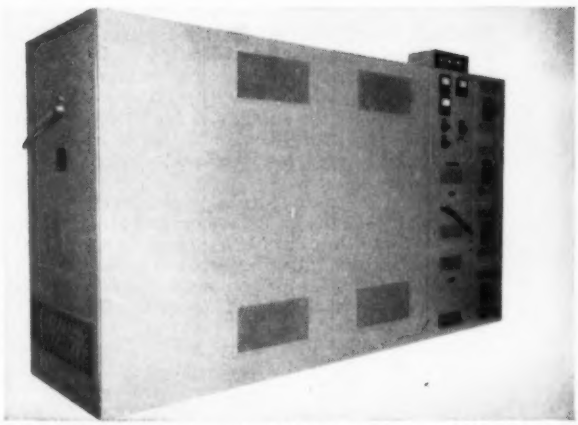


Schematic drawing of mill's electrical system. Each Westinghouse Power Center is served by its own 2300-volt feeder—assuring a high degree of service continuity.



Westinghouse 1000-kva Air-Cooled Power Center, 2300/440 volts, is factory assembled as a complete unit. Rating can be increased 25 percent by adding forced ventilation.

Get reliable, low-cost power by bringing high voltage close to loads

Men responsible for plant engineering functions will be interested in how St. Regis Paper Company provided reliable, low-cost electrical service in their new Pensacola mill. Round-the-clock production schedules had to be maintained—365 days a year. Power failures would work extreme hardship.

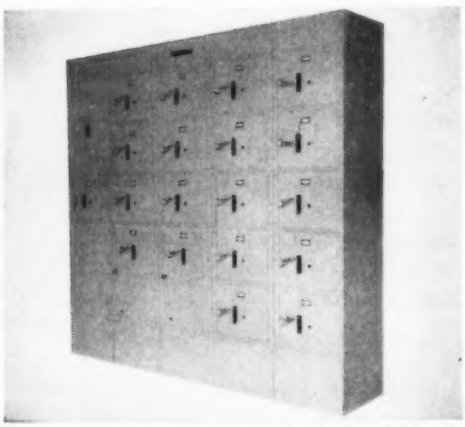
Called during the blueprint stage, Westinghouse helped the mill's engineers plan a modern radial distribution system. It is so designed that each power center is served by its own primary feeder. Thus, feeder and transformer faults are isolated quickly to the services of a single power center. A higher degree of service continuity is assured.

Westinghouse unitized equipment—pre-assembled and tested—helped keep power distribution costs to a minimum. Long runs of heavy, 440-volt feeders were eliminated. Feeder loss was cut. Wiring and conduit were greatly reduced.

Further, maintenance problems were simplified, since breakers and controls are easily accessible . . . and parts are standardized and interchangeable.

CONSIDER THIS: It takes *sound planning* and *co-ordinated equipment* to provide modern distribution systems, capable of meeting your plant power needs today and in the years ahead. Westinghouse offers you both . . . and backs them with years of experience, gained throughout all industry.

A call to your nearest Westinghouse office will bring an application engineer, well qualified to go over your distribution problems with you and your engineers. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94956



Starters are grouped in self-standing Westinghouse 440-volt Control Centers—factory assembled and wired with terminal boards. This simplifies installation and maintenance.

YOU CAN BE SURE...IF IT'S

Westinghouse

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$80,000 Saved By Field Engineering

Elwell-Parker put flanged wheels on this crane for railroad car repair shop. This saved great expense of paving yard for rubber tire crane. This Elwell-Parker crane also cut man-hours 90% on replacing car wheels.

ELWELL-PARKER truck installations are *Field Engineered* to your needs

Buyers of Elwell-Parkers get far more than just a quality truck. One of many plus values is a personal analysis of their material handling needs by an E-P Field Engineer. There are 40 of these E-P men, resident in all principal cities. The average experience of these truck specialists exceeds fifteen years . . . behind them is Elwell-Parker's unmatched, 47 years of truck know-how.

E-P Field Engineers can help you select exactly the right truck from the complete line of Elwell-Parker high and low lift platform trucks, fork trucks, or mobile cranes. To solve your individual handling problem, they will work closely with you to design a special or modified truck.

E-P Field Engineered installations insure the best possible truck performance at no extra cost.

Learn about all the other Plus Features of Elwell-Parkers by writing for this General Catalog. The Elwell-Parker Electric Co., 4176 St. Clair Ave., Cleveland 3, Ohio.

ELWELL-PARKER
POWER INDUSTRIAL TRUCKS
Established 1893

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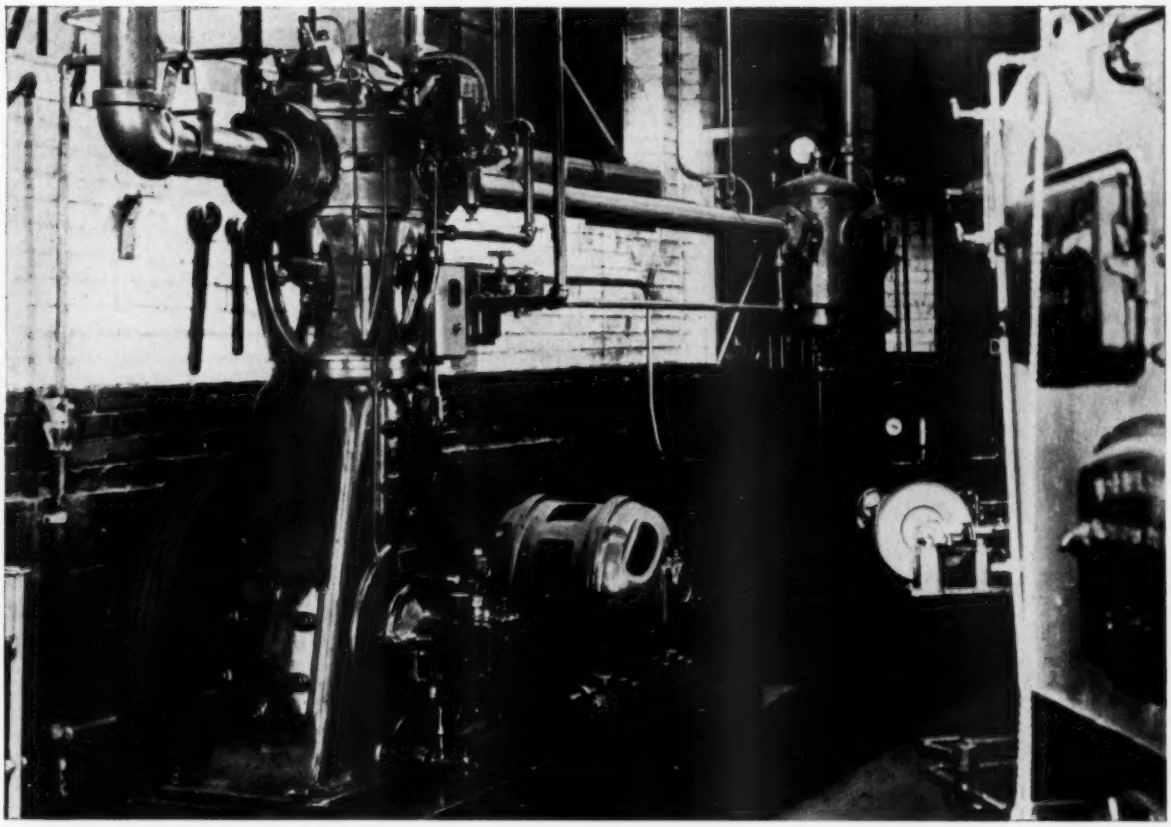
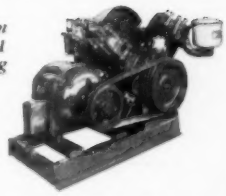


SAVE VALUABLE SPACE WITH THE EFFICIENT

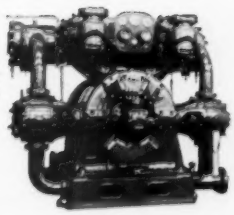
JOY WG-9 HEAVY DUTY AIR COMPRESSOR

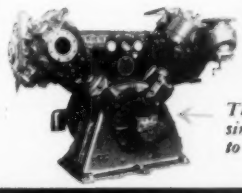
The JOY WG-9 Vertical, with its small base, saves valuable floor space. Built in a range of sizes to 881 CFM, for continuous heavy-duty service. The complete line of JOY stationary units—high and low pressure compressors, oil-free compressors, boosters and vacuum pumps—includes a type for every need, each incorporating exclusive features developed by JOY research. Supplementary products include the only complete line of vaneaxial fans and blowers, and the new JOY Oxygen Generator. ● *Write for free Bulletins.*

The JOY WL-80, in eleven sizes up to 641 CFM, with operating pressures to 125 psi.



The JOY WN-114, in single or twin units up to 7312 CFM.





The JOY WN-112, in single or twin units up to 3656 CFM.

W&D 13788

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

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DeVilbiss Automatic Spray Machines do double duty:

Military orders today

Bazooka shell assemblies get their protective finish with DeVilbiss chain-on-edge type spray equipment.

Civilian goods tomorrow

Vacuum cleaner housings get two-coat, hammered-metal finish on the same basic type of machines.

There's an advantage in using DeVilbiss Automatic Spray Equipment you may not have thought of. Besides helping you to produce defense orders at a profit, these machines can be quickly changed over to the finishing of civilian goods.

Then, when you switch from defense work to your regular line of products, you'll continue to save as much as 50% on time, labor and material costs—many times the cost of the automatic equipment.

DeVilbiss chain-on-edge machines coat both inside and outside of 300 to 1650 pieces per hour depending on the job. Rotary type machines are capable of as many as 5400 pieces per hour. Vertical and horizontal transverse machines spray flat products in sheet, roll or panel form at the rate of 3000 to 14000 square feet per hour.

A DeVilbiss representative will gladly give you information on all types of spray finishing equipment—spray booths, spray guns, air compressors, hose and connections, as well as automatic machines. He will tailor the equipment into a balanced setup geared to your finishing operations. Isn't it worth a call or a letter?

THE DEVILBISS COMPANY
Toledo, Ohio
Windsor, Ontario • London, England
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FOR BETTER SERVICE, BUY
DEVILBISS

BRANCH OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES, CANADA AND THE WORLD

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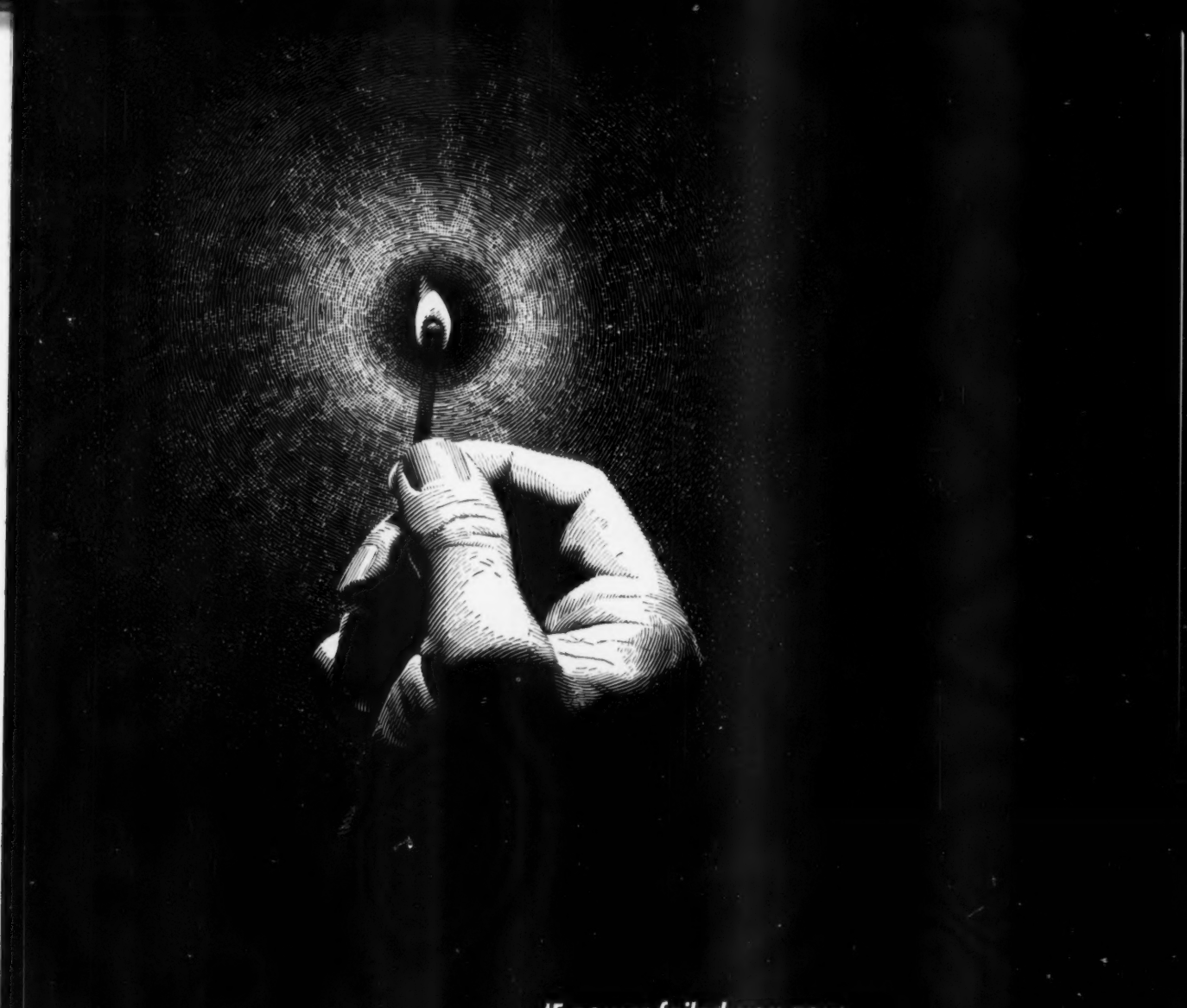


IF power failed you now . . .

would the feeble light of a match replace it?

What would you see in its light? Like everyone else depending on that downed power line, you'd see very little . . . and all that you'd see would be still.

Where safety . . . production . . . security depend on power, you need dependable stand-by power . . . you need the *automatic* protection of a Fairbanks-Morse Diesel power generating set.

Whatever your needs . . . whatever your budget . . . there is a complete Fairbanks-Morse power package designed with you in mind. For expert engineering assistance, write to Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill. Do it today—*before* power fails you.

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY
PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

Day-Brite "Close-up" Quality

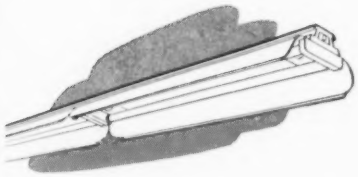
GIVES YOU EXTRA VALUE

for your plant lighting investment

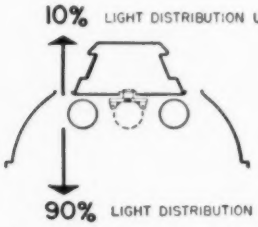
THIS IS A CLOSE-UP of the aperture in the reflector of a CFI DAY-LINE® industrial lighting fixture. These apertures are *die-embossed*. It would have been easier and quicker merely to stamp them out of the metal. But that would weaken the reflector—take away needed strength. Die-embossing retains strength and improves appearance.

DIE-EMBOSSED APERTURES are Day-Brite's way of giving you up-lighting without sacrificing ruggedness—one of many "close-up" quality features that mean extra value to you.

"CFI" means COMFORT FOR INDUSTRY



The CFI DAY-LINE® was designed to make plant lighting comfortable. The more energy a man has to use in seeing, the less he has left to do his work. And if he's bothered by shadows and harsh brightness contrasts, he not only produces less—he's a prime prospect for costly "on-the-job" accidents, too.



The diagram above shows the principle used by the CFI DAY-LINE® to give you more comfortable plant lighting. 10% of the light is directed upward through scientifically placed, die-embossed apertures in the reflector. 90% of the light goes directly down to the work area.

This direct-indirect distribution of light puts an end to dark ceilings and greatly reduces eye-disturbing brightness contrasts.

This greater comfort, plus the many Day-Brite "close-up" quality features —such as vibration-proof Turret* sockets on all units, all-white porcelain enameled reflectors, rust-inhibited parts, wiped reflector edges to eliminate chipping and crazing of the finish — make the CFI DAY-LINE the best industrial lighting value on the market today.

Write for full information. Ask for Bulletin OD-568. Day-Brite Lighting Inc., 5439 Bulwer Ave., St. Louis 7, Mo. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

*®G. E. Co.

"DECIDEDLY BETTER"
DAY-BRITE®
Lighting Fixtures

38

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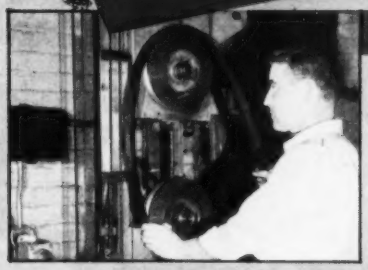
DURKEE ATWOOD V-BELTS

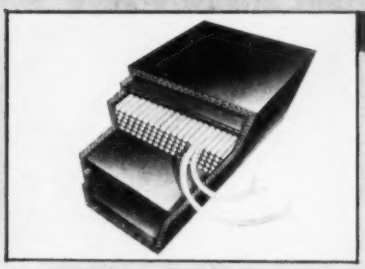
EXTRA VALUES

FOR USERS OF INDUSTRIAL V-BELTS



VERTICAL MATCHING ASSURES EQUAL POWER TRANSMISSION

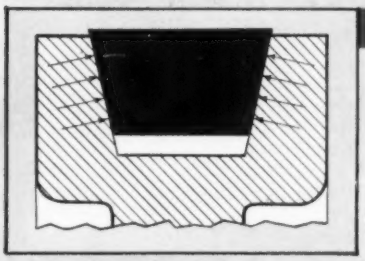
Durkee-Atwood's new vertical V-belt matching machines eliminate the "sag" error always present when V-belts are matched on horizontal matching equipment. Calibration of true running length assures equal power transmission from all belts on multiple belt drives. The machines also test for vibration and possible internal imperfections.



DU PONT CORDURA® RAYON MULTIPLE CORD CONSTRUCTION

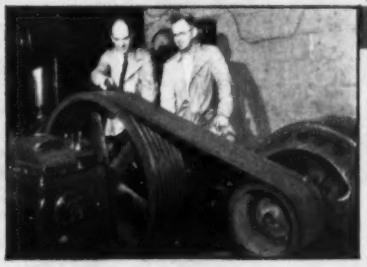
High-tenacity Cordura® rayon cords give Durkee-Atwood Industrial V-Belts longer life, less stretch, and greater shock resistance. Use of this revolutionary new cord material is another one of the reasons why D-A Industrial V-Belts are guaranteed to satisfy on any drive.

®Trademark E. I. Du Pont De Nemours & Co., Wilmington, Del.



STRAIGHT SIDEWALLS—FULL GROOVE CONTACT

Durkee-Atwood V-Belts are manufactured with straight sidewalls to maintain full groove contact at all times giving positive drive action. Straight sidewalls reduce slippage and assure smooth, efficient power transmission. The load is distributed evenly over the entire thickness of the belt giving it longer life.



FIELD-TESTED AND APPROVED

Every set of Durkee-Atwood Multiple V-Belts is balanced isodynamically. By running matched sets under full load on special testing equipment, Durkee-Atwood engineers verify their exact equality of load distribution and tension. When you buy Durkee-Atwood Multiple V-Belts you can count on maximum power transmission efficiency . . . pretested to guarantee high-production performance and longer belt life.

New Warehouse Stocks • Chicago, Atlanta, Cleveland, Jersey City

WRITE DEPT. P-3 TODAY FOR INFORMATION

DURKEE-ATWOOD CO.

MINNEAPOLIS 13, MINNESOTA

DURKEE ATWOOD V-BELTS

DA PRODUCTS SINCE 1918

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This scene from a Convair newsreel was taken in the San Diego plant to study the expansion of fuselage operations

Convair Goes Hollywood to Up Its Efficiency

MOTION PICTURES of fabrication and assembly departments, final assembly lines, offices, and exterior plant areas in operation are proving to be effective tools in increasing production efficiency in Convair's San Diego Division.

B. F. Coggan, division manager, recently inaugurated the use of plant newsreel films to assist his staff, industrial engineers, superintendents, and foremen in improving factory operations.

Like football coaches reviewing films of a game, the Convair production group detects conditions which need correction by analyzing departments in operation from advantageous camera locations.

All of Convair's major assembly buildings are equipped with overhead cranes. The perspective of departments from crane levels has proved to be most effective in planning production improvements. Although most of the scenes are taken from cranes, many shots are obtained from balconies, ground positions, roof tops, and a few have been taken from a camera plane.

Narrated by division executives, the films are shown from a reversible-type projector. This permits careful study and discussion of problems exposed by the camera.

Recently, in making an analysis of the hot forming operations on drop hammers, pictures were made of the old method of using conventional gas torches to heat the dies. Following a change to Calrod heaters, additional pictures were taken. This made it possible to demonstrate to production supervisors the advantages of clear, scientific thinking without the delay involved in conducting a group into the area for on-the-spot inspection.

The films have proved especially useful in studying plant layout progress. Serving as a live report on program activation, the films show graphically the implementation of new layouts frequently made in aircraft plants. This method is much more effective than explaining new layouts by drawings or statistical reports.

Safety and housekeeping programs have been improved through the use of motion picture cameras. Footage of various departments obtained during working hours has uncovered some unsafe practices which had previously escaped the attention of individual observers.

Focusing attention on work methods, the films reveal instances where workers are holding parts which should be held in fixtures. Crowded or sparsely filled work stations can be recorded from levels which give a better over-all view of departments in operation. Congested transportation inside and outside of buildings and inefficient material handling practices have been improved.

One of Convair's motion picture cameramen shoots plant scenes from a crane in the San Diego Division. The scenes are then studied by plant and industrial engineers as prelude to making desired changes in area size or in processes

Convair's division newsreels are narrated by executives who point out the proposed changes and discuss department operations for increasing efficiency. Here, B. F. Coggan, San Diego Division manager adds narration to some footage

New... Mercury YAK 430

Sit down, center control fork truck. 4000 lbs. capacity

Included in the many advanced design features of the new MERCURY "Yak" 430 are...higher maximum fork elevation ★ increased free lift ★ greater speed ★ lighter chassis weight ★ shorter turning radius ★ simple *low pressure* hydraulic hoist system ★ new unit drive with quick detachable motor and self-energizing hydraulic brakes ★ new compensating castor type steering axle ★ Timken duo-grip parking brake actuated by driver's seat. Write for complete details.

MERCURY MANUFACTURING CO.
4002 S. Halsted St., Chicago 9, Ill.

Send copy of new MERCURY "Yak" 430 Bulletin to:

NAME _____

COMPANY _____

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Lining Up Heavy Machines?—Try Wire

Proper alignment of heavy machines means smooth, efficient operation . . . An easy way to line up heavy machines is by use of piano wire as suggested in this article

By H. NYE JOSLEYN

THE FUTURE EFFICIENCY and smooth running of a machine depends upon careful alignment of the parts to eliminate undue strains and friction.

An easy way to accomplish this is by the piano wire method of lining up machines, which also provides a needed extra dimension for locating the various parts in relation to each other. Calibration is simplified and compounded errors due to complicated measurements are avoided.

This method can be applied equally well on new installations or on re-assembly of machines that have been taken apart for repair. It is used on turbines, reciprocating engines, machines in tandem, air compressors, propeller shafts in ships, and similar large installations.

Lining Up Compressor

The steps used in lining up a two-stage reciprocating air compressor include principles sufficient to undertake most other machine installations. The necessary results to be obtained in lining up such a compressor are as follows:

1. The center line of the cylinder, stuffing box, and guide must be identical in each frame of the two stages.
2. The guide wearing surfaces must be parallel with the walls of the cylinders.
3. The center line of the drive shaft must be in the same plane and be at right angles to the center line of the cylinders.
4. The center line of both the high pressure cylinder and low pressure cylinder must be level and in the same plane.

Assuming that the position of the foundation bolts has been checked and found accurate, the first step is to remove the moving parts from both stages of the compressor. These consist of the piston, crosshead, connecting rod, and crank assembly. In setting the empty frames on the bases use metal wedges and shims at each bolt hole so as to allow about a one inch clearance for the final grouting.

A light piano wire is stretched through the high pressure frame near the center. This wire is terminated through 2-in. holes bored in planks which are located as part of a wooden standard outside either end of the frame. These wooden standards are placed at an arbitrary 3-ft distance from the frame to allow for an adequate working area. The 2-in. holes allow for vertical or horizontal movement of the wire in centering it with the cylinder, see Fig. 1.

The wire is stretched very tight by means of square metal spools or by means of a ⅛-in. bent pipe. Suitable metal spools may be made by tightening square nuts on a ½-in. stud bolt. The ⅛-in. bent pipe is about 10 in. long, bent on one end, and used as a crank. It is locked in position by pushing the crank handle down along, and flush with, the back of the plank.

After using a liquid level, to level up the bottom of the cylinder and guides in the high pressure frame, the wire is lined up to be in the exact center of the cylinder and guides. This wire must also line up with the cross center of the shaft bearing.

Another wire is stretched across the center of the drive shaft bearings of both frames and fastened in a similar manner as the wire in the high pressure frame. In leveling up this shaft wire it is placed *over* the wire in the frame with as little clearance as possible but so as to prevent one wire from being affected when the other is moved. This position of the shaft wire, over the frame wire, is considered advisable so that the bearings will be raised about 1/32nd of an inch over the plane of the center of the frame to allow for the seating or wearing in of the bearing, see Fig. 2.

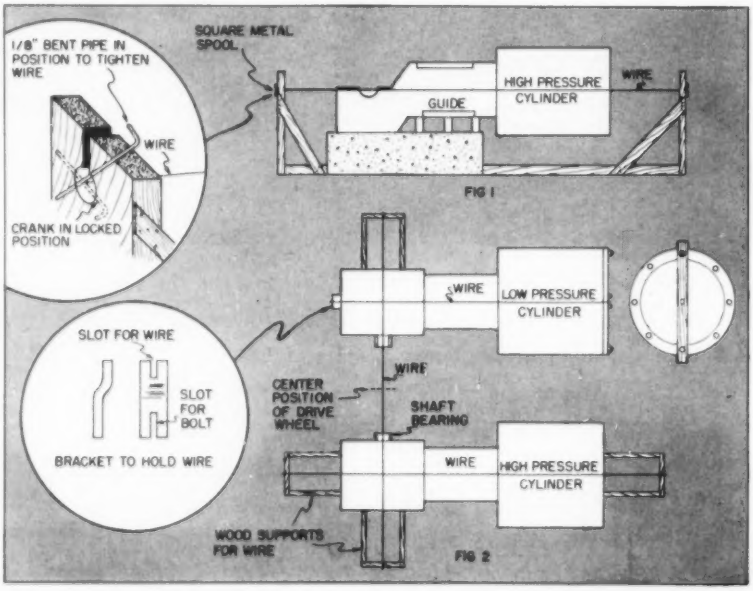
The two wires are centered and brought into position during the same period to hold their relative positions intact.

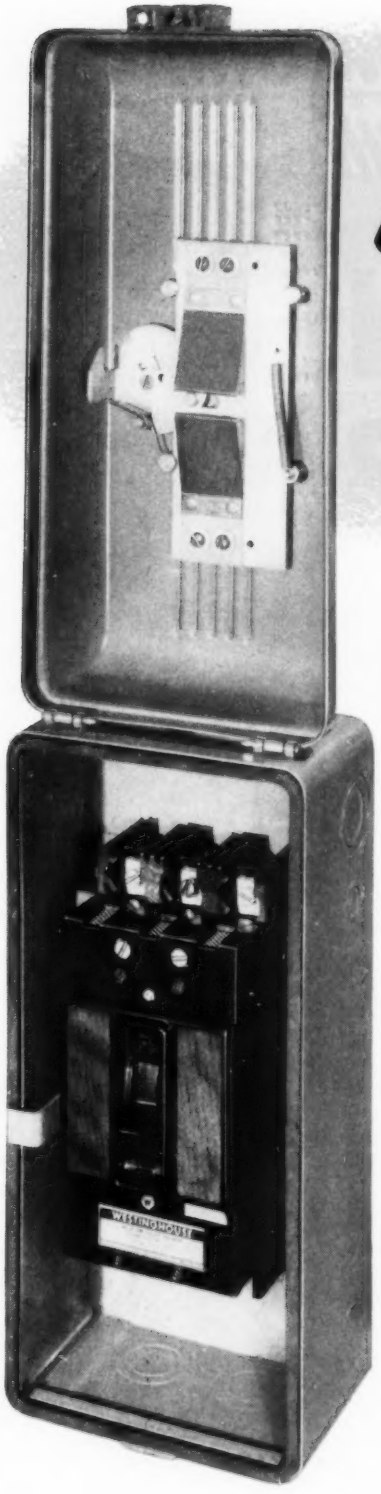
In lining up the shaft bearings have the upper bearing halves in place with their caps bolted firmly down.

In aligning the wires, a pin stick gage is a handy and speedy tool. It is easily made from ¼-in. pieces of soft wood tapered at each end. A pin is pushed into each pointed end making an over-all length about one half the diameter of the cylinder, see Fig. 3. Tapping or adjusting the pins slightly will readily change the length of the stick as desired.

(Continued on page 194)

Sketches indicate how piano wire is used to line up a two-stage reciprocating air compressor. Fig. 1 shows how wire is stretched through high pressure frame. Fig. 2 shows how the drive shaft bearings of both of the frames are lined up





Restore service in seconds

WITH AB-I CIRCUIT BREAKERS

AB-I Circuit Breakers require no replacement parts, can be safely "Reset" by anyone in seconds after a fault is cleared.

Production down time is minimized, valuable man and machine hours of work are saved as a result.

After a fault is corrected, a workman simply turns the breaker handle to "Reset" and back to "On" to restore service. He isn't exposed to "live" parts, and should the fault continue, the breaker merely trips again. Trip free, it cannot be held closed against a fault.

AB-I Circuit Breakers give complete protection against short circuits and overloads, yet ride out harmless temporary overload peaks. Mechanism is quick-make, quick-break. Calibration is factory set and sealed; stays exact and tamperproof for the life of the installation. Outstanding "De-ion®" Arc Quenchers extinguish arcs in 1/120 of a second.

Find out how AB-I Breakers can save you time and money. Call your Westinghouse Distributor or write for B-5456, Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-30093

"Of course, circuit breakers save money."

YOU CAN BE SURE...IF IT'S

Westinghouse

APPARATUS DISTRIBUTOR WESTINGHOUSE

AB-I Circuit Breakers

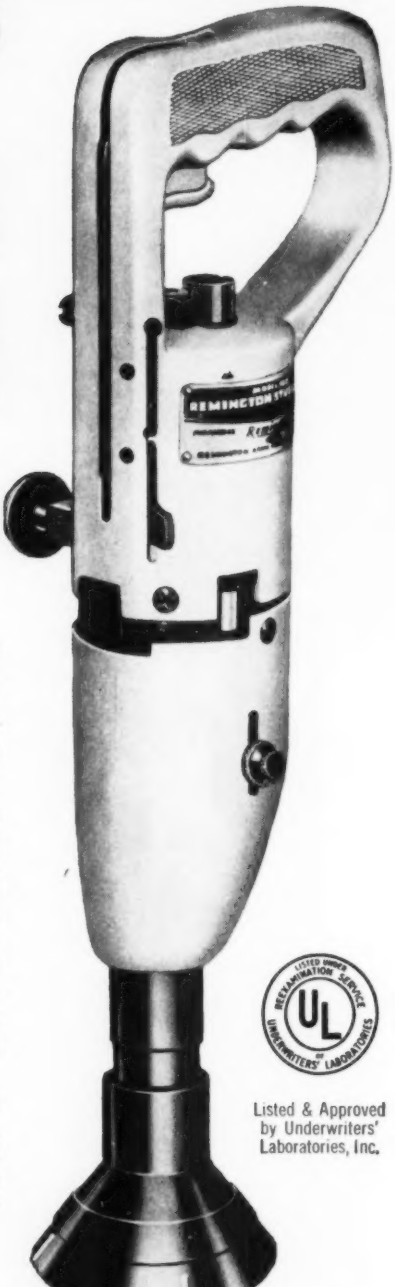
THE COMPLETE LINE

For more facts circle 573 on Reply Card

You can drive studs ARROW STRAIGHT into steel or concrete with

MODEL 450 REMINGTON STUD DRIVER

The widest power range of any powder-actuated tool!



The Model 450 Remington Stud Driver is the most efficient fastening method in use today. Its exclusive advantages are unequaled by any other powder-actuated tool.

You get consistently straight driving on every type of fastening job with the long heel cap on all Remington cartridges. It acts as a perfect gas seal and provides extra power. These colored heel caps clearly mark the six different 32-caliber power loads that are available. You can select the *right* cartridge for each job quickly and easily.

The Remington Stud Driver needs no separate parts for power control or loading—nothing to lose or break. Just a twist of the wrist opens the Model 450. Insert stud and power cartridge as a unit . . . close and you're ready. Triple safe, this superior tool has a separate lever that must be depressed and *held* with one hand before and during squeezing of the trigger with the other hand. Two *additional* devices prevent operation except in proper fastening position.

Completely self-powered, the Model 450 sets up to 5 studs per minute in fastening steel or wood structural pieces to concrete or steel surfaces. Its light weight—only 5½ pounds—makes it ideal for use overhead or in confined spaces. To speed operation further, an exclusive ejector snaps the fired case out of the tool instantly—no fumbling, no tools needed.

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest sporting arms manufacturer.*

Listed & Approved by Underwriters' Laboratories, Inc.

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. PE-3
Remington Arms Company, Inc.
939 Barnum Ave., Bridgeport 2, Connecticut

Please send me my *free* copy of the new booklet showing how I can cut my fastening costs.

Name _____

Position _____

Firm _____

Address _____

City _____ *State* _____

NEW, FREE BOOKLET shows you a hundred different ways the Model 450 Remington Stud Driver can speed *your* construction fastening. Packed with illustrations, it tells you where and how this tool can save time, reduce fatigue and cut costs. Send in the coupon below for your copy.

"If It's Remington—It's Right!"

Remington DUPONT

For more facts circle 574 on Reply Card

Built in Horizontal (illustrated), Vertical Delivery and Power Throw types — 47 different models.

Five popular sizes, A.G.A. approved for natural, mixed, manufactured, L.P. and L.P.-air gases.

Modine builds a unit heater to match your heating requirements

Whether it's steam, hot water or gas . . . look to Modine for the *right* unit heater

WHATEVER your unit heating requirements, you can match them exactly from the complete Modine line. Because Modine builds steam, hot water *and* gas-fired units, you're sure of an unbiased recommendation. And, remember, when you buy Modine, you buy the greatest name in unit heating. As a leader in this field for more than 25 years, Modine gives you balanced heating performance — perfect heating comfort plus maximum fuel economy. Get all the facts. See the Modine representative listed in your classified phone book, or write Modine Mfg. Co., 1563 DeKoven Ave., Racine, Wis.

Modine STEAM AND HOT WATER UNITS

Special heating coil designs for steam and for hot water assure best performance for each type of system. Discharge air temperatures of 110-120° F are correctly related to air velocity for heating at its best. All-copper coils defy corrosion because fins are bonded to tubes and tubes are brazed to headers. Pre-formed tubes with individual expansion bends absorb stresses, assure long life.

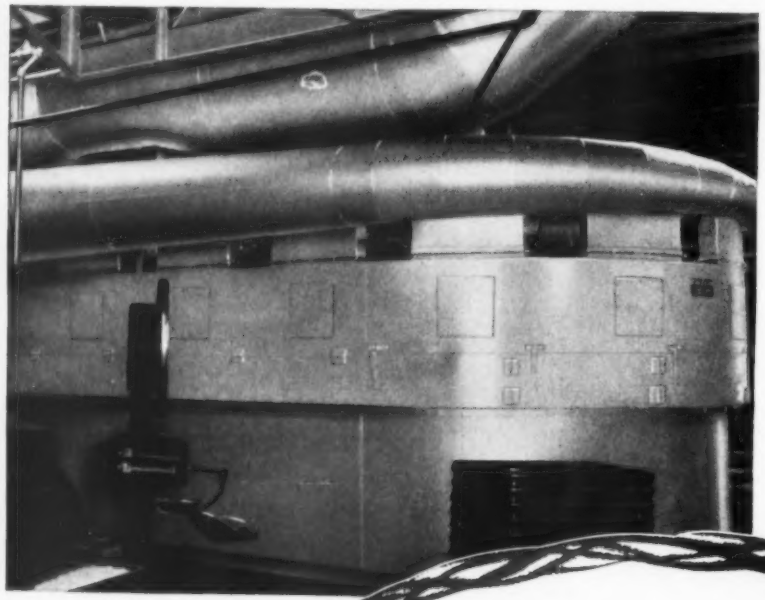
Modine GAS-FIRED UNITS

Modine is the only gas unit with both *stainless steel* heat exchanger and burner. Lighter weight means easier, less expensive installation, plus faster heat delivery — *within five seconds* after thermostat calls for it. Individually fired tubes provide higher heat transfer. Elongated ports — four times free area of conventional drilled ports — minimize clogging and simplify routine cleaning. U-1186

Ask for Bulletin 149-A on steam and hot water and Bulletin 652 on gas unit heaters

Modine UNIT HEATERS

For more facts circle 575 on Reply Card



KIRK & BLUM Fume Control on an Automatic Plating Machine in a noted auto ignition parts plant. Note hinged anode access and inspection doors just above tank top.

KIRK AND BLUM FUME CONTROL SYSTEM

...Saves 5 Ways

1. REDUCES AIR VOLUME REQUIRED
2. LOWERS MAINTENANCE COSTS
3. CUTS REPLACEMENT COSTS
4. IMPROVES WORKING CONDITIONS
5. ELIMINATES DAMAGE TO OTHER EQUIPMENT

Considering the cost of plating equipment, can you afford to be without really efficient fume control? In both large and small plants, Fume Control Systems engineered, fabricated and installed by KIRK & BLUM have shown substantial savings by increasing the life of plating equipment.

A hood — with convenient access openings encircles the tanks — preventing cross currents and reducing air volume requirements.

Fumes are picked up at the outside of the tank, clean air is drawn over the machine's mechanism in the center, thereby keeping damaging corrosive fumes away from costly moving or mechanical parts.

Let a KIRK & BLUM Engineer survey your plating operations without obligation.

Write for Booklet F, showing typical installations. The Kirk & Blum Mfg. Co., 3116 Forrer Street, Cincinnati 9, Ohio.

KIRK AND BLUM
FUME CONTROL SYSTEMS

For more facts circle 576 on Reply Card

BENJAMIN "Magna-Flo" Systems Excel!

that's why Overall Lighting Costs are LOWER!

Because Benjamin "Magna-Flo" Systems excel by every Quality Standard—lighting, electrical and constructional—they can provide high illumination levels at low overall lighting cost. Such cost involves more than the original price of the units. Overall lighting cost also includes the costs of installation, operation, maintenance and replacement. Add them all up and see why you're ahead with "Magna-Flo" Systems (individual unit or continuous line)—because "Magna-Flo" excels by ALL QUALITY STANDARDS!

This chart gives some of the important reasons why:

"MAGNA-FLO" CUTS INSTALLATION COST	"MAGNA-FLO" CUTS MAINTENANCE COST	"MAGNA-FLO" CUTS OPERATION COST	"MAGNA-FLO" CUTS REPLACEMENT COST
wide variety of knockouts facilitate wire entrances into unit.	Porcelain Enamel reflecting surface is easy to keep clean with soap and water.	made for efficient utilization of high light output T12 Slimline lamps.	famous Benjamin "built-like-a-battleship" construction of heavy gauge steel.
complete line of sliding hangers.	exclusive "Springloc" lampholders make possible "quick-in, quick-out" lamp maintenance.	high power-factor ETL-approved ballasts for continuously-cool, efficient operation.	rigid channels and reflectors withstand toughest industrial vibration.
single, rugged channel coupling for continuous mounting.	Speedy, exclusive "Lok-Latch" reflector fasteners.	high reflection factor remains constant because genuine Porcelain Enameled reflector does not discolor or become dull with age.	96" reflectors are made in two sections, kept perfectly aligned by positive alignment clips.

FREE Bulletin AD-5705 *brings you complete specifications on Benjamin "Magna-Flo" Lighting Systems—famous for "Task-Matched" Lighting Installations. Benjamin Electric Mfg. Co., Dept. PE, Des Plaines, Ill.*

Benjamin "Magna-Flo" Systems are Sold Exclusively through Electrical Distributors

New Industrial Research Building Features Roof Parking Facilities

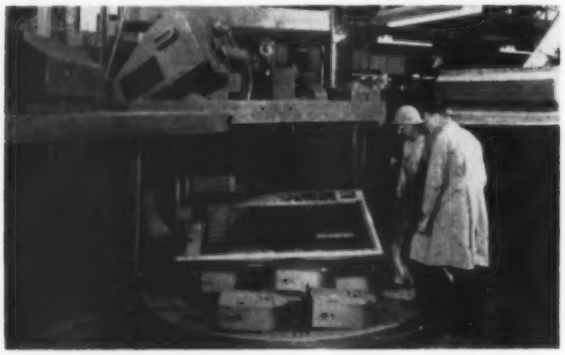
A new research building, now under construction at the Maytag Co., Newton, Iowa, will practically double the facilities of the Research and Development Division. The building will be windowless, with 10-zone air conditioning, and has the heating, ventilating, and cooling systems installed in a semi-second story.

Spaced among the fluorescent lights used in the building will be tubular sun lamps, to furnish ultraviolet radiation.

Reinforced concrete is being used throughout the structure, with no steel beams required. To accommodate the employee automobiles formerly parked on the area occupied by the new building, parking facilities will be provided on the roof of the building, with a ramp at the rear, leading to the ground. This ramp is equipped with heating elements to keep it clear of ice and snow. Parking space is also provided in the basement, and in a small area immediately in front of the building.

Blast Cleaning Operation Eliminates Paint Peeling Problem

Abandoning pickling, power sanding and hand methods of cleaning in favor of blast cleaning, Vapor Heating, Inc., Chicago, has eliminated a problem of paint peeling on various components of its steam generators, blowers, and other heating equipment.



In addition, the 8-ft diameter Pangborn Rotoblast table-room speeds cleaning, simplifies handling and reduces man-hours. The company estimates that the cleaning equipment saves at least 10 man-hours per heating unit.

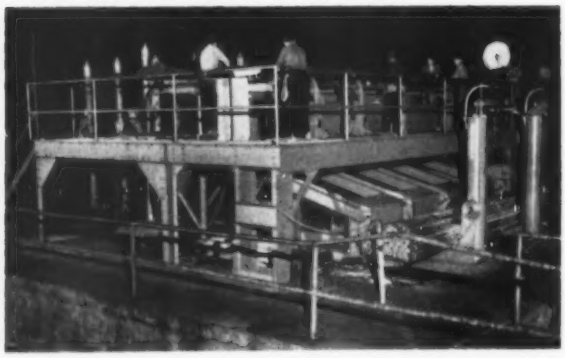
For each steam generator produced, approximately 25 parts are blast-cleaned for painting. The cleaning removes weld slag, shop dirt, mill scale and rust, thus providing a better bonding surface for the paint. Typical parts cleaned include large control cabinets for the steam generators, blower housings, and welded steel coils, most of which are cleaned in 2 minutes.

The blast unit, manufactured by Pangborn Corp., was installed in the cleaning department with its rotating table at floor level. As a result, loading and unloading operations are simplified.

Pipe Bundling on Elevated Platform Saves Lifting and Walking

Installation of a specially designed elevated steel platform has saved much walking and lifting during the bundling of continuous weld steel pipe at the Spang-Chalfant Div. plant of The National Supply Co., at Etna, Pa.

The pipe averages 21 to 22 feet in length and is put into bundles ranging from 3 to 12 pieces, depending on the pipe diameters. Three men tie each bundle, one man at each end and one in the middle.



Formerly, after a bundle was tied, the middle bundler had to walk half the length of the pipe, to get out of the way, so that the bundle could be physically lifted and dropped into cradles behind him.

Use of the elevated platform permits each bundle to be lowered by gravity into cradles attached to a scale platform at floor level. The bundles pass underneath the middle bundler, so that it is unnecessary for him to move from his position, nor is it necessary for a bundle to be physically lifted.

The bundling table consists of four skid rails upon which the lifts of pipe are placed. At the end of each skid is a bundling wheel, consisting of a steel disc, 20 in. in diameter, with 3 equally spaced nests cut into it. After a bundle has been tied in the nests, a bundler presses a foot pedal and the bundling wheels index one-third of a revolution. This automatically discharges the bundle and brings the next nest of the bundling grooves into position to receive the next lot of pipe. A special indexing mechanism stops the bundling nests in the correct position after each cycle.

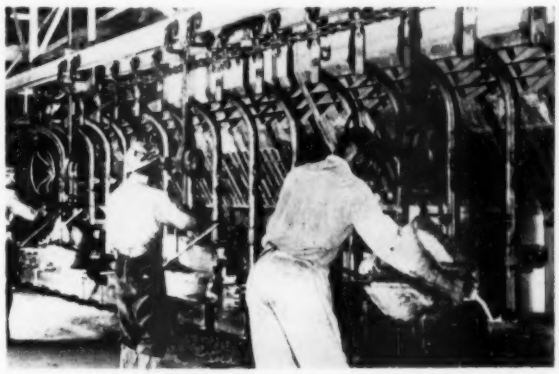
Using a 15 ton Howe scale, equipped with a Teleprint remote weight recorder, the weight of each lift is recorded in the mill office as it goes on the scale.

Mold Conveyor Speeds Production Operations in Foundry

Pouring operators work against the movement of the mold conveyor at the Red Lion foundry, placed in operation by The Budd Co. at Philadelphia.

Metal patterns are used for the automotive brake drums produced by the foundry. Ten molding machines are operated in pairs to produce the upper and lower halves of the mold. Molten metal is poured into the molds from three 450-lb ladles. These are supported on a 145-ft long, loop-shaped monorail which conveys them to the pouring zone. When the ladle is empty, the operator circles around to obtain more molten metal from the cupola. Smoke and fumes are collected and exhausted from the area.

The foundry, built at a cost of $1.5 million, turns out 4000 brake drums each eight-hour shift, and is designed so that a second molding line may be installed when warranted. It is so well integrated and so thoroughly mechanized that approximately 45 tons of finished castings are produced by only 45 men per shift, or one ton per man per shift.



Electromagnetic Models Determine Transient Voltages

A new method of determining transient voltages in transformers by using electromagnetic models has been developed by the General Electric's Power Transformer Department at Pittsfield, Mass.

The electromagnetic model reproduces faithfully the voltage magnitudes and wave shapes between any two points in a transformer, for applied waves of all types, and for all transformer connections. Its applications include: improvement of transformer designs; development of radically new winding structures; failure detection; and prediction of how a transformer behaves as a part of the power system.

The electromagnetic model combines the inductance effects of a geometric model with the capacitance effects of an equivalent circuit to give accurate results.

Shown is a three-phase transformer, 33,333 kva, 115,000 to 37,090Y to 4160 volts and its electromagnetic model. The model is 1/6th the size, 1/216th the weight and was available in 1/10th the time of the actual unit.

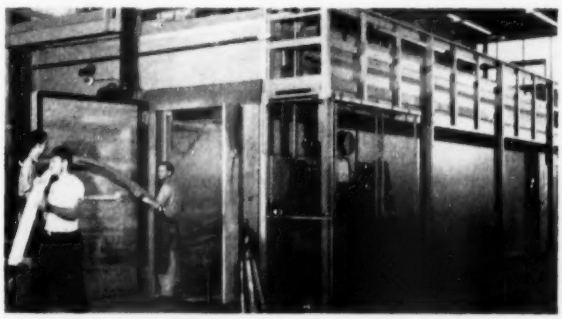
Deep Freezing Facilitates Operations, Reduces Breakage in Aircraft Manufacture

A 5000 cu ft refrigerator, larger than two box cars, in which metal can be kept in cold storage, is easing shaping operations, reducing breakage and smoothing production flow at the Lockheed Aircraft Corporation, Burbank, Calif. Measuring 40 ft by 12 ft and standing 11 ft high, the new $20,000 ice box, three times as large as previous types, can cool 2500 lb of aluminum from room temperature to -20 F in two hours.

With this technique, metal parts become soft (semi-hard) when they are subjected to high heat in a process, which in the end, gives them extra hardness and strength. If they are allowed to cool at normal room temperature they harden rapidly. Such hardness would be a hindrance during forming and shaping operations. But, it has been discovered, quick-freezing keeps the metals soft indefinitely. Parts heated to as much as 970 F in giant ovens are quenched, rushed into the ice box, frozen, and then removed for forming while still cold and easily workable, whenever machines and men are ready.

These advantages were listed for the big freezer: 1. Ability to schedule long runs of identical parts on metal presses or milling machines by building up a large quantity in the refrigerator. 2. Reduced set-up and press time. 3. Proximity to forming machines located only a few feet away. 4. Faster over-all production by elimination of delays between heat-treating and forming. 5. Reduced scrap because of parts' improved malleability while cold.

The top of the freeze box incorporates an overhead door measuring 34 ft by 4 ft, accessible to an overhead crane and large enough to accommodate such pieces as the 32 ft-long, one-piece wing panels used on Super Constellation transports.



Portable Surface Resistance Indicator Aids Welding Accuracy

A portable surface resistance indicator used by the Spotweld Co., Cleveland, Ohio, has taken the guesswork out of the company's welding operations. The indicator provides a rapid and accurate measurement of the resistance between pieces of metal to be resistance welded, thus speeding up the company's production of aircraft and refrigeration parts fabricated of aluminum.

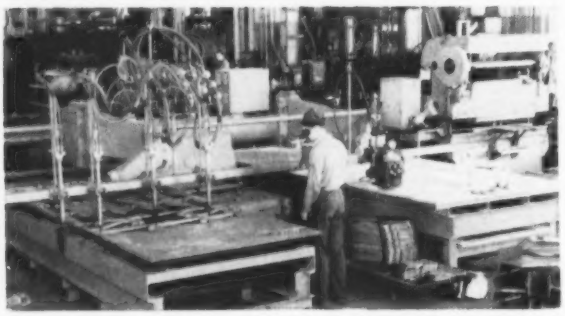
In operation, the pieces of metal are placed between the jaws of a sample holder, desired pressure applied, and the surface resistance is indicated on a microhmmeter. The entire operation is completed in a few seconds and enough pieces can be checked in 15 minutes to last through a 12-hr welding period. The resistance indicator is made by General Electric Co.

Far-Infrared Radiant Heat Used For Drying Ceramics

Far-infrared electric radiant heaters, replacing an infrared lamp oven section of a convection oven, are now being used to provide a more uniform drying process by Buffalo Pottery, Inc., Buffalo, N. Y.

The far-infrared section of the oven consists of 18 Chromalox electric radiant heaters mounted at right angles above a conveyor. This mounting arrangement applies uniform heat to the ware, placed on the belt at random. The heaters, made by Edwin L. Wiegand Co., Pittsburgh, are bolted to angle iron and enclosed in sheet metal. Heat is zoned by providing each bank of nine heaters with separate, variable input controllers.

Electronic Tracer Cuts Plate-Steel Parts



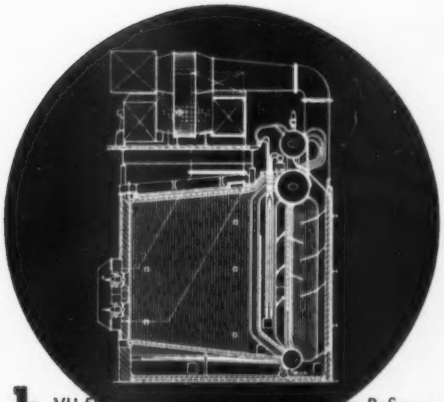
Latest in precise flame-cutting equipment has been installed by the Thew Shovel Co., Lorain, Ohio. Based on the principle of the electric eye, an electronic tracer utilizes up to four oxy-acetylene torches to cut plate steel parts on one table from an ink-drawn, glass-cloth templet on another table. The electric eye follows the pattern of the one stage, while the arm-connected torches simultaneously cut on a parallel stage. The company has found that use of the equipment, built by Air Reduction Co., produces stronger fabricated parts for the power shovels and cranes built by Thew. Cutting accuracy, with the parts held to closer tolerances, is greatly improved over the hand-cutting method.

Glass Fiber Insulation Used In Field House Roofing

Glass fiber insulating material, Ultralite, was one of the construction materials used when a war surplus Butler blimp hangar was converted to provide a field house for a St. Louis, Mo., school.

The hangar, measuring 168 ft by 148 ft by 65 ft high, was built up in small sections to form an arch-type structural support for the corrugated aluminum roof sheeting. The insulating material, made by Gustin-Bacon Manufacturing Co., is light-weight and faced with a moisture-barrier. It was applied directly beneath the corrugated sheeting and compressed over the structurals by rolling from the center of the roof down each side. Corrugated sheeting and insulation were then fastened by means of screws with neoprene washers.

Future repairs or changes in design will necessitate only the removal of a section bordering the affected area and its replacement after completion of the work.



1. VU-50 ...m Refinery. Burning natural g... ...nit has a capacity of 260,000 lb of steam per hr at an operating pressure of 400 psi and steam temperature of 660 F.

one VU is only the beginning

It seems that the story *never ends* with the purchase of the first Vertical-Unit Boiler. Company after company has installed a VU unit . . . liked it . . . and then bought another – and another – and often another. This is true in every branch of industry, but the three typical examples described below and illustrated by the accompanying drawings will serve to illustrate the point.

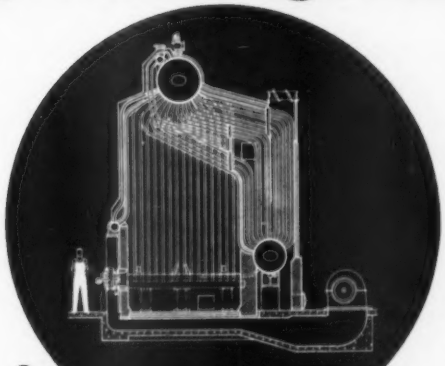
A Petroleum Refinery (1) ordered its first Vertical-Unit Boiler in 1937. A second VU Unit was installed in 1941, and a third in 1950. For another of its plants, two VU Units were ordered in 1942; a third, in 1947.

An Automobile Company (2) installed its first two VU Units in 1947. Two more were ordered for another of its plants in 1948; then three more units for a third plant in 1949 and two more for still another plant in 1950.

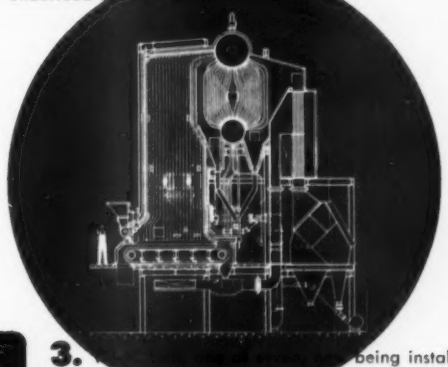
A Chemical Company (3) ordered two VU Boilers in 1939. In 1946, five more were ordered for three of their other plants. In 1949, two more were ordered for one of these same plants, and in 1950 two more units for a fifth plant. In 1951, seven more VU Units were ordered for still another plant – eighteen units for six plants in twelve years!

• • •

And so it goes – in all sections of the country – companies representing every type of industry . . . paper, food, mining and metal working, brewing, rayon, aircraft – and many others in addition to the examples pictured here . . . ordering and reordering VU Boilers. There must be a reason – and there is. It's lower steam costs and top reliability. These companies have found *through experience* what they can expect in economy and performance when they buy VU Boilers.



2. VU ...talled in an automob... ...gas. VU-10 Boilers range in ...000 to 60,000 lb of steam per hr. The... ...be fired by spreader, underfeed or...



3. ...being installed in a Chem... ...rs will be fired with C-E Spreader Stokers (continuous discharge type). The capacity of each is 60,000 lb of steam per hr at an operating pressure of 325 psi; no superheat.

COMBUSTION ENGINEERING – SUPERHEATER, INC.

B-639A

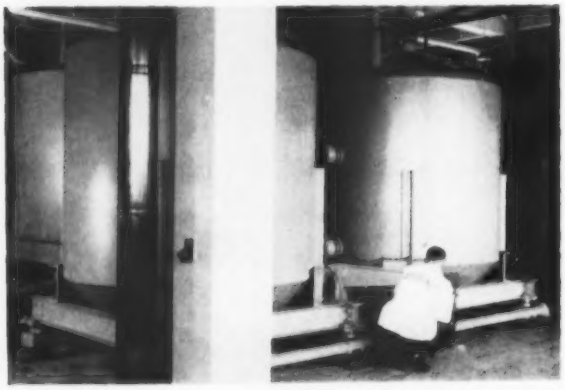
200 MADISON AVENUE, NEW YORK 16, N. Y.

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

For more facts circle 578 on Reply Card

Brewery Operates Dust Control System; Salvages Valuable Grain Dust

Dust control is essential to the operation of the Duquesne Brewing Co., and at its new Pittsburgh Brew House, Pangborn equipment has been installed to collect dust from a number of sources throughout the plant.



These sources come under two major headings: 1. collection of dust from grain ingredients prior to manufacture into beer, and 2. collection of dust from spent grain after the brewing process. By means of this system 500 lb of grain dust, valuable as cattle feed, is salvaged from each carload of grain received.

A suction system is used to unload incoming grain from railroad freight cars, at which time dust is collected. When the grain is weighed prior to milling, a dust collecting hood completely surrounds the hopper, for 100 per cent collection of dust.

A remote control panel, controlling all automatic brewing processes, is wired with an interlock which will not permit any process to begin unless the dust control system is operating. This interlock provides as complete protection as possible against the flour-like dust spreading over the area.

Machines Simulate Driving Conditions to Test Axles

An axle-testing machine, built by General Electric Co., and capable of simulating actual driving conditions that a truck weighing 80,000 lb traveling at 60 mph would experience, has been installed at the Alden Indoor Proving Ground of the Timken-Detroit Axle Co., Detroit, Mich.

A 350 hp dynamometer simulates the truck engine driving the axle through transmission gears. It can deliver up to 450 hp over a drive shaft speed range of from 400 rpm to 3000 rpm. Two output dynamometers, rated 550 hp, 650 rpm to 3000 rpm, are attached to gears located at the ends of the axle and record the torque output. Amplidyne equipment provides field power for the 3 dynamometers and a 750 kw motor-generator set.

Axles are tested by placing them on the test stand and subjecting them to simulated highway conditions by means of a magnetic tape. The tape recorder provides repetition of the operator's speed and torque signals used in the initial manual test. As each stress is imposed, recording instruments indicate continuously the speed, torque, or load, as well as providing a permanent record of the conditions imposed on each axle.

Special Rooms Provide Variety of Conditions for Testing Products

Products developed under the ideal conditions prevailing in the Helio-lab of S. C. Johnson & Son, Inc., Racine, Wis., may now be tested under any encounterable conditions of use in seven test rooms.

Each of these systems was designed by York Corp. of York, Pa., to provide any of the various conditions under which the company's products may be used. System No. 1 is designed to maintain any temperature from zero to 40 F; system No. 2 will maintain any temperature from 40 F to 100 F, with relative humidity of 40 per cent at 60 F and 75 per cent at 100 F. Other humidity conditions are available. The third system maintains any temperature from 100 F to 140 F, but has no humidity control. Any temperature from 100 F to 140 F, and relative humidity of 35 per cent to 40 per cent at 100F and 75 per cent at 140 F is available in the fourth.

A constant relative humidity of 50 per cent is maintained in system No. 5, but the temperature may be varied between the limits of 77 F and 90 F to hold the relative humidity constant.

System No. 6 provides only ventilation and heating of from 70 F to 75 F of the salt spray and humidity room, while the seventh system is designed to maintain a constant temperature of 77 F with an allowable variation of 2 F and a constant relative humidity of 50 per cent with an allowable variation of 1 F in dewpoint.

Where Bolted Enclosures Are a Must

SPECIFY

ALLEN-BRADLEY TROUBLE FREE STARTERS

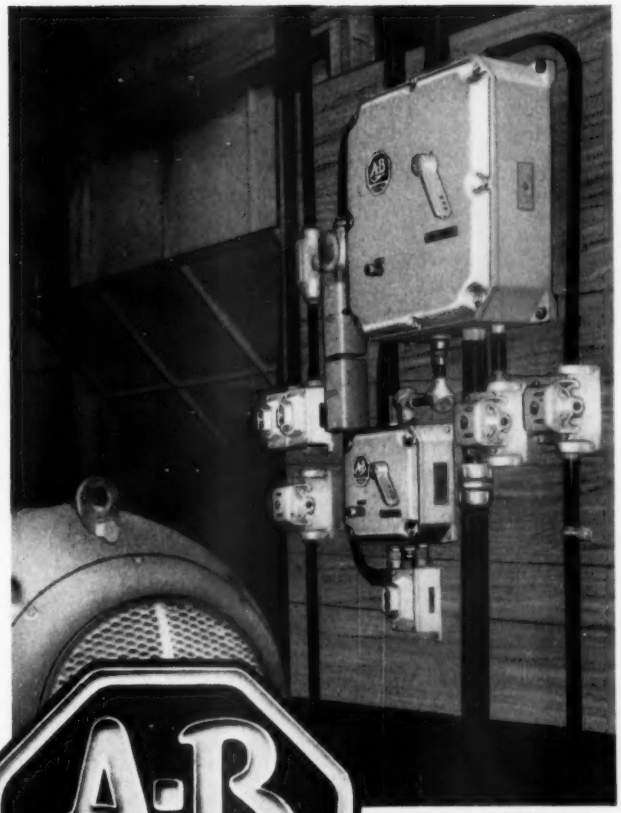
No Contact Maintenance

Freedom from contact maintenance is, of course, desirable in any motor starter . . . but especially so for controls in safety enclosures with bolted covers.

It takes time to remove the bolts from heavy cast iron enclosures, especially where corrosive conditions are bad. This job should be done as infrequently as possible. For this reason, electricians and maintenance men "in the know" specify Allen-Bradley trouble free motor controls. They know from experience that Allen-Bradley switches with double break, silver alloy contacts will operate for months . . . and even years . . . without requiring even contact inspection. They know also that the simplicity of Allen-Bradley starters means freedom from trouble . . . hence, freedom from production stoppages.

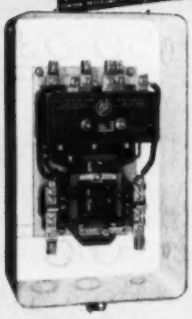
When your application requires bolted safety enclosures, specify Allen-Bradley. For that matter, specify Allen-Bradley whatever the application may be!

Allen-Bradley Co.
1317 S. First St., Milwaukee 4, Wis.



Installation of Allen-Bradley starters and push buttons in NEMA Type 9 Enclosures for hazardous dust locations.

When we say, "Never Clean 'Em," we're not kidding



Bulletin 709 Solenoid Starter in a NEMA 1 Enclosure.

No insulating oxides can form on the A-B patented contacts. Hence there is no reason to file or clean these silver alloy contacts and thus shorten their life. Practical experience has proven that Allen-Bradley solenoid starters are good for millions of trouble free operations . . . without any worry about contact maintenance . . . even in the toughest industrial service.

NEMA 4
Watertight

NEMA 7
Hazardous Gas Locations

Allen-Bradley Automatic Starters are available in these Bolted Enclosures

●

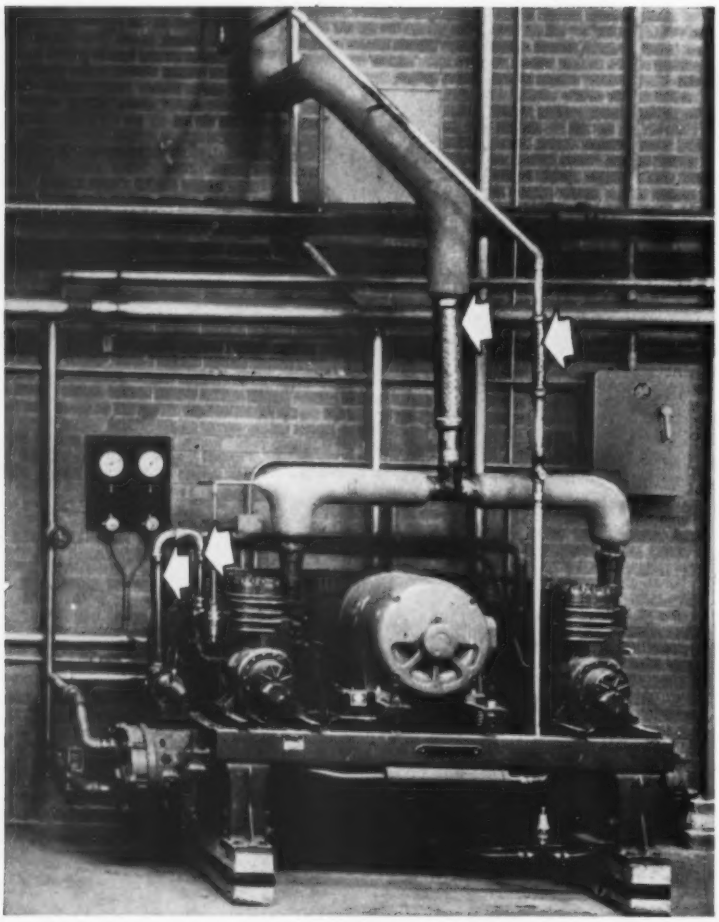
NEMA 8
For Hazardous Locations

NEMA 9
Dust-tight

NEMA 11
Corrosion Proof

ALLEN-BRADLEY QUALITY MOTOR CONTROLS

For more facts circle 579 on Reply Card



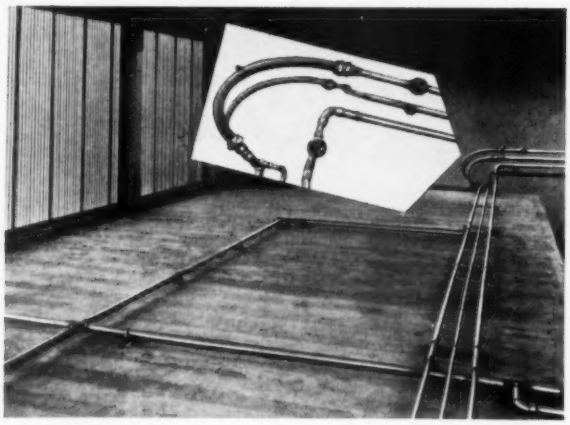
News about flexible metal connectors

Here they absorb VIBRATION, permit EXPANSION, withstand PRESSURE and HEAT

VIBRATION These twin compressors are part of an office air conditioning system. To prevent transmission of noise and vibration to refrigerant lines, American Vibration Eliminators have been used. They have proven their usefulness many times where vibration might crack rigid piping or make maintenance difficult. Leakproof and permanent as piping, they safely convey such liquids and gases as freon, brine, chlorides, etc., under high and low pressure.

PRESSURE and HEAT In this Littleford Pressure Distributor, American Flexible Steel Tar and Asphalt Hose, in constant motion, sprays hot tar under pressure. It handles easily, withstands outdoor exposure. If you want hose that can endure such rugged service, yet installs quickly, is convenient to use, and needs little attention, plan on American Flexible Metal Hose and Tubing.

Write for Booklet SS-50 – gives complete information on American Flexible Metal Connectors and their uses. The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.



EXPANSION Hot water for this shower system flows 200 feet. To make proper expansion loops with rigid piping would be a plumber's nightmare of joints! The simple solution: easily installed American Flexible Metal Connectors. They allow for ample expansion and readily handle required pressure. They may be also used to carry steam, oil, syrups, solvents and even certain semisolids. 52263

ANACONDA

wherever connectors must move *American* flexible metal hose and tubing

For more facts circle 580 on Reply Card

SARCO electric temperature control

ACCURACY AND SENSITIVITY BY SIMPLE ELECTRICAL MEANS

"Very successful in our operation, and I specify them on all our new equipment," says Thomas Allison, Plant Engineer of Southern Gravure Service, Louisville, Ky. ***(See photo at left)***

IN HIS CASE the operation is plating, an industry in which SARCO electric controls have found wide adoption.

There are many others: For example, dryers in the textile, tanning, food and chemical industries; dyeing and wet finishing processes in textiles; processing, distilling and evaporating in chemical plants.

SARCO'S complete line includes also thermostats and solenoid or motor valves for space heating, air conditioning and refrigeration control.

Get the whole story by writing for bulletins 1025 and 1080.

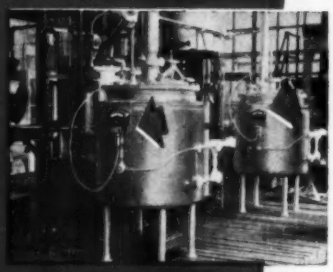
SARCO COMPANY, INC.
EMPIRE STATE BUILDING, NEW YORK 1, N. Y.
SARCO CANADA LTD., TORONTO 8, ONTARIO
REPRESENTED IN PRINCIPAL CITIES

PLATING

In copper and chromium plating of rotogravure rolls, the temperature of plating solutions is held to within ½°F by Sarco Electric Indicating Temperature Controllers. Photo taken in Southern Gravure Service plant, Louisville, Ky.

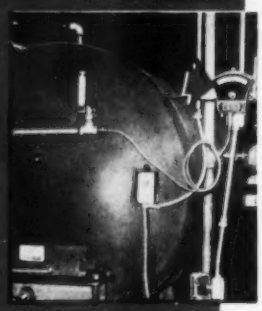
CHEMICAL

Hoffman La Roche Pharmaceutical Co., Nutley, N. J.—the jacket water temperature of these stills must be held to within ½°F. For the past 9 years, Sarco LSI Indicating Temperature Controllers have been doing that job.



FOOD

Chocolate milk and soft drinks in bottles and cans are processed in Fort Wayne Sterilizers. Many users equip these Sterilizers with Sarco LSI Electric Indicating Controllers to hold the temperature to within ½°F. Hook-up sketches and case histories on request.



TEXTILE

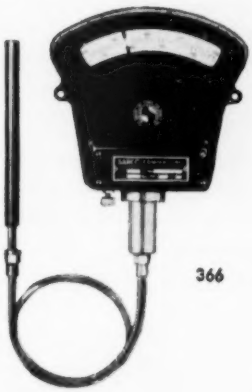
The Backus Hosiery Conditioner processes 15 denier nylon hosiery—40 dozen per 1 hour cycle. The humidity and dry heat are controlled by two Sarco Electric Indicating Temperature Controllers. Over 500 LSI's have been factory-installed on these Conditioners by Backus Machine Works, Carlstadt, N. J.

TYPE LSI

An extremely sensitive and accurate Electric Indicating Temperature Controller for temperatures from minus 90°F to plus 650°F. Controls electric heating elements, motors, solenoid or motor valves to maintain constant temperature.

A built-in thermometer makes setting easy and provides a continuous check on temperatures maintained without the bother of continually changing charts.

A double switch type L2SI is available for alternate heating and cooling control, or step control of heating or cooling.



366

For more facts circle 581 on Reply Card

WARREN PUMPS

keep their heads!

. . . . . in other words, *maintained efficiency* has always been, and will continue to be, a fundamental virtue of all Warren Pumps. *Original* efficiencies in a pump can be very misleading and a source of disappointment in its long range efficient life expectancy.

The three most important factors affecting maintained efficiency are hydraulic design, leakage losses and friction losses. The generous acceptance of Warren Pumps for well over half a century is convincing evidence that Warren has the engineering ability, skilled pump mechanics, and plant facilities to handle all of these important factors to the definite advantage of their customers, from the angle of longe-range efficiency, minimum wear, and low power costs.

"THEY KEEP THEIR HEADS"

WARREN STEAM PUMP COMPANY, INC.
WARREN, MASSACHUSETTS

G-1

WARREN QUIMBY PUMPS

WARREN PUMPS

CENTRIFUGAL • RECIPROCATING • ROTARY

For more facts circle 582 on Reply Card

What do you do when you don't have the right size v-belt in stock?

1

Contact your supplier for a replacement

...and wait for delivery

...wait—and watch production stay at zero

2

Send someone to get the required belt

...and pay your employee while he goes for the belt

...pay through loss of production

3

Stock VEELOS...

...and always have the *right size* belt when you need it

...any length can be made up from a 100-foot reel

...inventory is automatically maintained

...available from 350 distributors

GET ALL THE FACTS

This Veelos Data Book gives complete details about construction, installation and uses. Write for free copy of this money-saving book today.

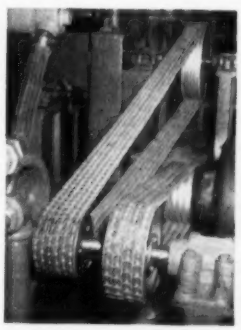
MANHEIM MANUFACTURING & BELTING COMPANY
615 Manbel St., Manheim, Pa.

VEELOS in stock is Production Insurance

Belts for replacement always on hand—just 4 reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts.

Link construction permits quick installation—without removing outboard bearings.

Adjustability provides controlled tension on each belt—vibrationless, full power delivery is assured.



VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH · ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

For more facts circle 583 on Reply Card

...with TYCOL lubricants on hand!

Name any machine you can think of. There's a Tycol lubricant for it: For instance, what about heavily loaded gears and bearings? . . . Tycol Apreslube oils give you the tremendous load-carrying capacity you need. Electric motors? . . . Tycol Avalon oils or Tycol Armitage greases keep them running smoothly.

Steam cylinders? . . . Tycol Atwater oils resist the washing action of condensate. You always get top performance with Tycol lubricants. Why? . . . Because each Tycol grease and oil is manufactured from high quality base stocks and *tailored* for a specific application. Get the full story of the entire Tycol line from your local Tide Water Associated office today!

Over 300 Tycol industrial lubricants are at your disposal . . . engineered to fit the job!

REFINERS AND MARKETERS OF VEEDOL . . . THE WORLD'S MOST FAMOUS MOTOR OIL

For more facts circle 584 on Reply Card

TYCOL
INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh
Philadelphia • Chicago • Detroit
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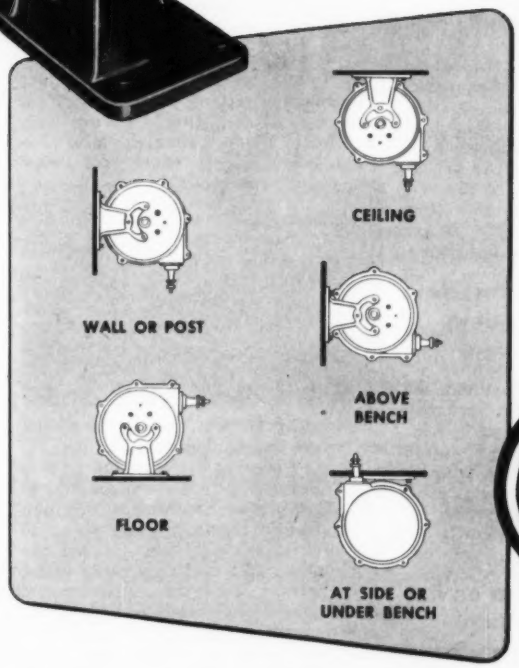
TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE · NEW YORK 4, N. Y.

STOP WASTE MOTION... LOST MAN HOURS *with*

WAYNE PRODUCTION BOOSTER HOSE REELS



Get more production per worker with Wayne Retriever Hose Reels . . . engineered to reduce wasted motion. Easily installed . . . easily reached—overhead, underbench, floor or beside bench—Wayne Hose Reels have proved themselves "production-boosters" in all types of plants from coast to coast.

Wayne Hose Reels work like a window shade. Rachet holds hose at any desired length. Slight pull on hose releases catch and hose rolls back automatically to pre-determined setting . . . rubber bumper stops it. Ruggedly built for hard continuous use.

Cut worker fatigue . . . increase productive time . . . reduce tool maintenance costs . . . install Wayne "Production-Booster" Hose Reels on your production and assembly lines. There's a Wayne Reel to meet every requirement whether for air, oil or water. Write for new folder on hose reels.

THE WAYNE PUMP COMPANY

SALISBURY, MARYLAND • TORONTO, CANADA

Wayne

NATION WIDE SERVICE

INDUSTRIAL HOSE REELS

FOR AIR, WATER, FLUID LUBRICANTS AND COOLANTS

For more facts circle 585 on Reply Card

NEW PRODUCTS summarized for your convenience

Edited by M. E. Heniken

Further details on any product are available without cost or obligation. Circle item numbers on Reader Service Cards on pages 35-36, 197-198.

1—FORK LIFT, 4000-lb capacity, is truck of all work

The Octopus is a 4000-lb capacity fork lift truck outfitted with a special carriage and attachments to handle nearly a dozen different types of loads. Here are some of the things it's designed to do: handle ordinary pallet loads; work as a side-shifting truck to spot loads in "tight" areas; haul and stack drums and paper rolls; empty drumloads of bulk materials; lift bales of cotton and crude rubber, and pick up a variety of pallet sizes after automatically adjusting for proper fork spacing.

A standard battery-powered fork truck, the Octopus is equipped with company's four-purpose carriage and it uses four attachments: revolving head (semi-permanent) drum clamps, hydraulic drum up-ended and clamp-spikes (all readily detachable). (For information circle No. 1 on Reader Service Card.) The Baker-Raulang Co.

2—MAINTENANCE MACHINE is three-purpose unit

The 3-Way Maintainer not only sweeps mechanically many times faster than a man with a broom, but it also provides a suction system for picking up dust and dirt as well as a blower system for blowing down dust from machines and other equipment—the dust being picked up by suction system.

This unit thus serves as a complete tool, not only for sweeping, but also for picking up accumulated dust and dirt in stock bins, on lighting fixtures, walls and windows and for picking up chips and cuttings on and under machinery, as pictured.

Changeover from sweeper to suction or blower systems is made quickly without stopping the engine, company explains, since pick-up wand, extensible hose, pick-up and blow-down

tools are all carried on the sweeper ready for use. The 3-Way Maintainer is built in two standard sizes for sweeping 24- and 36-in. aisles, the larger model sweeping 30,000 to 45,000 sq ft per hour when on continuous sweeping duty (For Bulletin S-106 on the unit circle No. 2 on Reader Service Card.) Wilshire Power Sweeper Co.

3—CONTROL VALVE for handling boiler blowdown

By automatically taking over the job of regular boiler blowdown, this new intermittent blowdown control valve is said to effect substantial savings in operating efficiency, labor and maintenance downtime. In operation, it causes repeated disturbance of boiler water, preventing water crystal growth and formation of the scale and residue that normally build up insulation against the primary fuel. The valve is described as particularly valuable where feed water supply is badly contaminated.

Permanently attached to the blowdown outlet of the boiler, and equipped with an automatic cycle-timer, this valve is designed to assume complete blowdown control. Manufacturer says it can be adapted to all types of industrial boilers and, once correctly set, requires practically no attention. (For descriptive booklet circle No. 3 on Reader Service Card.) Rice Industries.

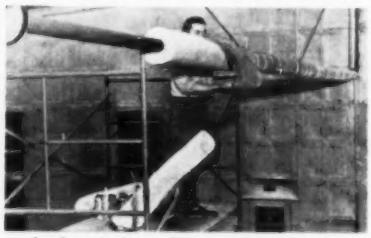
4—SHOVEL TRUCK offers fast pick-up, easy wheeling

This truck is intended for quick and easy moving of barrels, hampers or cases in factories and warehouses. Of sturdy all-welded construction, the truck has a heavy steel nose plate 19 in. wide at base and tapering to 13 in. at front. It has two 6-in. dia wheels; handle is heavy 1¼ in. tubing. The truck weighs approximately 50 lb. (Circle No. 4 on Reader Service Card.) The Palmer-Shile Co.

5—INSULATION for use on hot or cold piping, fittings

Fiberglas Aérowrap, a wrap-around pipe insulation, is flexible and easily applied to flanges, fittings and valves as well as to pipes of all sizes. It is described as a fine fibered insulating blanket with a special binder, as soft and resilient and having high heat-saving thermal efficiency. This insulation comes in 100-ft rolls, 36 in. wide and ¾ in. thick—it may be cut with shears, knife or paper cutter. Company says it may be used on pipes from sub zero to 600 F and be applied in various degrees of thickness.

After being wrapped around pipes this insulation may be kept in place with staples, adhesive, or Fiberglas cord tie on 6-in. centers. Four kinds of jackets may be installed over it: black roofing felt, white asbestos paper-faced felt, corrugated aluminum sheet, or rolled galvanized sheet metal. According to manufacturer the only precaution necessary for use of Aerowrap on cold lines is a vapor barrier to prevent condensation on cold pipe surfaces. The vapor barrier is applied over the Aerowrap,

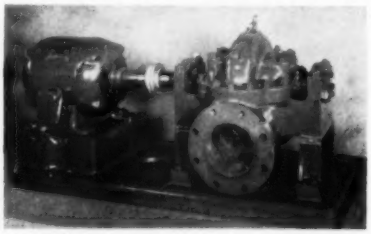


and, for indoor lines not subject to abuse, it provides a sufficient jacket.

Aerowrap is said to save more heat and cost less to install than most rigid insulations and, because of its compressibility, to require much less storage space. (For more details circle No. 5 on Reader Service Card.) Owens-Corning Fiberglas Corp.

6—CENTRIFUGAL PUMPS are single stage, double suction

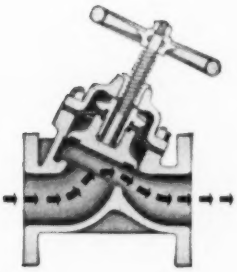
Standard features on all the new Fig. 3405 pumps include renewable stuffing box bushings, sealed bearing housings, cowl-type glands suitable for use with quenching liquids, stainless steel impeller keys, Teflon water seal rings,



die-formed stuffing box packing and corrosion-resistant gland bolts.

Compactness is an outstanding feature. Bearing spans have been kept to the shortest practical distance, resulting in savings in length of as much as 50 per cent in some models. Casings are horizontally split and removal of upper half permits inspection, maintenance and removal of rotating element without disturbing suction and discharge piping or pump and driver alignment.

In the Fig. 3405 line there are three different assemblies on shafts and rotating parts. However the wide interchangeability of parts in each assembly makes it possible to provide 19 different pump sizes in the three groups. In addition, a locking design of shaft sleeves makes it possible to change the



FOR SAFER CONTROL ---- OF HARD-TO-HANDLE FLUIDS

CRANE Packless Diaphragm Valves

Now Available in New Materials

WORKING PRESSURES—up to 150 pounds. Water, air, oil, or gas, 180°F. maximum temperature, depending on valve size and materials.

You asked for it—and now Crane gives you this outstanding Diaphragm Valve in a new wide choice of body, disc insert, and diaphragm materials—in unlined or lined patterns. Whichever is specified, Crane design gives you important advantages including—long diaphragm life . . . positive shut-off in case of diaphragm failure . . . less resistance to flow with minimum pressure drop . . . easy operation . . . simplified maintenance at lowest upkeep cost.

Full specification data is in your new Crane 53 Catalog—or ask your Crane Representative.

SCREWED ENDS, UNLINED Sizes ½ to 2 in.
Brass, Cast Iron, Aluminum, or 18-8 Mo body and disc. Furnished with neoprene, Buna N, and natural rubber diaphragm and disc insert.

FLANGED ENDS, UNLINED Sizes ½ to 6 in.
Cast Iron, Aluminum, or 18-8 Mo body and disc. Furnished with neoprene, Buna N, and natural rubber diaphragm and disc insert.

FLANGED ENDS, LINED Sizes 1 to 6 in.
Cast Iron body only. Lined with neoprene or hard natural rubber. Disc coated with neoprene or soft natural rubber.

•

Other body and disc materials, as well as linings, available on special order. Also sliding stem valves for automatic operators of all types.

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

For more facts circle 586 on Reply Card

NEW PRODUCTS

(Begins on page 148)

direction of impeller rotation easily without additional parts. Thus, 38 pump combinations are offered.

The pumps can be supplied with electric motor, belt, or steam turbine drives, if desired. Capacities range from 200 to 6400 gpm, with heads up to 260 ft. (For Bulletin 721.6 on the pumps circle No. 6 on Reader Service Card.) Goulds Pumps, Inc.

7—ENCLOSURES for line starters, circuit breakers

This company announces the incorporation of several improvements in its Type EPC Condulets. The new design, the Model M52, is described as the most flexible of explosion-proof line starter and circuit breaker enclosures. In addition to its original features of threaded joint construction throughout, light weight and flexibility, the new design offers: built-in pushbutton stations and selector switches, additional back conduit and horizontal through-feed conduit entrances, improved reset mechanism, neophrene gasket for protection of upper cover joint, and increased wiring space.

Type EPC Condulets are available for all sizes of line starters and combinations up to Size 4, and for circuit breakers alone up to 600 amp. They are available for most motor control and circuit breaker manufacturers' equipment. (For Bulletin 2634 on them, circle No. 7 on Reader Service Card.) Crouse-Hinds Co.

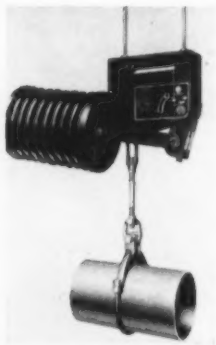
8—WHEEL BLOCK, heavy duty, for trucks and trailers

Made of high strength cast alloy steel, the Casteel Safety Wheel Block is said to assure safe holding even under adverse conditions of grade, surface and load. It has cast-in holes on the bottom plate for nailing to freight car or truck floors or shipping platforms.

The block has a wide, curved tread and no sharp corners or projecting surfaces. A heavy center rib support is designed to resist maximum thrust and give the wheel block a wide margin of strength and safety. A feature is the heavy steel gripper teeth on the bottom plate to keep the block from creeping or slipping even on ice or snow. Provision for hook or chain attachment is made by a cast-in hole on the center rib support. Owner's name may be cast on bottom plate to prevent theft. Block is painted safety yellow, weighs 12 lb. (Circle No. 8 on Reader Service Card.) Calumet Steel Castings Corp.

9—PIPE HANGERS for high temperature lines

Constant support that is mathematically perfect for all positions of travel for high temperature process and steam piping is said to be supplied by the new Model R Constant Support Hangers. A feature of their design permits



10 per cent increase or decrease in their load by field adjustment of a single bolt, without impairing their constancy, according to company.

The new design also results in hangers which are smaller in size for the load carried, so less head room is required. The hangers can be bolted directly to the building structure and the frames are drilled for either single or double rod suspension. Three regular frame sizes providing maximum travel of 4, 8 and 12 in. will take care of loads from 48 to 9304 lb.

Company says these hangers are non-resonant and in combination with the use of anti-friction needle bearings, friction has been reduced to a minimum. The new design provides favorable small ratios between spring force and supported load to minimize bearing stress and prolong the life of the hanger. (For data circle No. 9 on Reader Service Card.) Grinnell Co., Inc.

10—FORK STACKERS, small, with "big truck" features

Latest addition to this manufacturer's Powrworker line is this telescopic tilting fork stacker offered in four base capacities from 1500 to 3000 lb all rated at 24 in. center line of load. Two standard models are offered in each capacity incorporating company's Hi-Lo stack feature—one has an 83 in. over-all height with 64 in. of free lift and 130 in. maximum lift, and the other, especially designed for highway truck loading, has a 68 in. over-all height with 49 in. free lift and a maximum lift of 100 in.

These are light weight trucks, compact in length and width for utility in minimum aisles and low capacity floors. Lifting speeds vary from 21 to 14 fpm, depending on load. (For details circle No. 10 on Reader Service Card.) Clark Equipment Co.

11—SOLDERING IRONS for production line service

Industrial electrical soldering irons in this new line are designed to stand up under production line punishment. According to manufacturer, the irons' "thermostatic brain"—thermostatic action without thermostats—controls heat so well that fusing and tip burning are eliminated. Company says the irons heat fast and stay at production heat, and there is no radionic interference while they're in use. They are described as economical because of their heat output efficiency. Irons in this line include a wide range of sizes for industrial use. They operate on 110-120 v, a-c or d-c. (For catalog sheets on these soldering irons circle No. 11 on Reader Service Card.) Wall Mfg. Co.

12—TROLLEY CONVEYOR for light duty applications

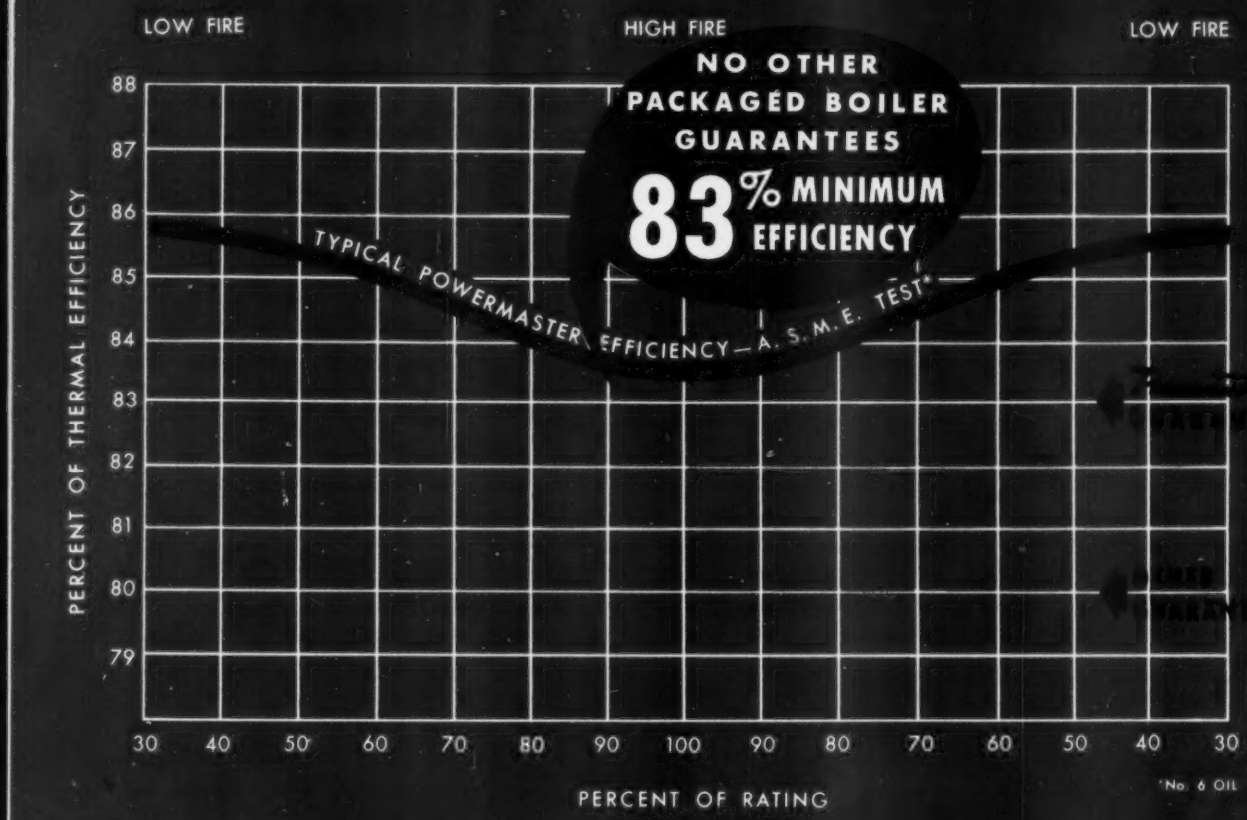
The Chainveyor is a fully-enclosed continuous chain conveyor engineering for dependable overhead service in a

wide range of applications. It requires little maintenance, company says, and its extremely flexible short radius curves and straight tubular track sections are easily installed. (Circle No. 12 on Reader Service Card.) Matthews Conveyer Co.

13—TURBINE-TYPE PUMPS, close-coupled, 3 to 30 gpm

A new line of Apco V-Type Pumps with mechanical seals are announced as available in 3 to 30 gpm capacities and with self-priming features where desired. The close-coupled design of these turbine type pumps reduces the pump-motor assembly to small over-all size, it is noted, and because the pump and motor shaft are integral, misalignment troubles are avoided and noise reduced.

Four different positions for suction and discharge connections make for installation flexibility. Cover, inner ring and impeller of these pumps are of bronze for corrosion resistance. The pumps have a high suction lift, 28 ft (at sea level)—reduced capacities beyond 22 ft. Company says that because pumps handle vapor entrapped in liquid without losing prime they won't vapor bind. (For data circle No. 13 on Reader Service Card.) Aurora Pump Co.



Only Powermaster guarantees 83%!

The "pay-off" on a boiler is its operating efficiency!

Take a look at this typical efficiency curve of POWERMASTER . . . then compare A.S.M.E. tests with those of any other boiler! At less than full load (which is normal in field operation) notice that POWERMASTER efficiency actually *increases.*

There's a reason for such efficiency. The POWERMASTER is the development of 68 years' experience in boiler manufacture. Continuing research and progressive engineering have consistently been reflected in POWERMASTER design:

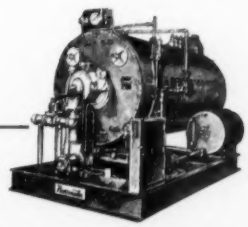
- **FIRST to provide the Voriflow air-atomizing burner.**
- **FIRST to provide full modulating cam control.**
- **FIRST to provide immediate change-over from oil to gas firing.**
- **FIRST to provide a *complete* packaged unit.**

Point-by-point, POWERMASTER welcomes comparison. Before deciding on a new boiler for your plant, be sure to get the facts on the new POWERMASTER with VORIFLOW combustion. Just drop us a line and we'll be glad to send you complete information.

Powermaster®

PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP; pressures to 250 psi.



ORR & SEMBOWER, INC. • *Established 1885* • 840 MORGANTOWN ROAD, READING, PENNA.

NEW PRODUCTS

(Begins on page 148)

14—SAND BLAST HOSE is light in weight, flexible

Described as 15 per cent lighter and 100 per cent more flexible than many types of sand blast hose, the new Highflex is said to take the fight out of sand blasting. It is suggested for use on castings, stone, glass and metal surfaces. It conducts sand, steel shot or other materials at high velocity. Highflex incorporates an abrasion-resistant, anti-static tube, ¼ in. thick, reinforced with single braid of multiple strands of high strength cotton cord, and enclosed in a heavy black, abrasion-resistant cover. Its increased flexibility is said to reduce worker fatigue, increase output. (For Catalog Section 4440 describing Highflex circle No. 14 on Reader Service Card.) The B. F. Goodrich Co.

15—HANGING SCALE does many weighing jobs

The Model 2110 Hanging Scale was developed as a multi-purpose scale and will handle pilot weighing of parts or products as well as test and estimating work. It is designed for simplicity of operation and easy portability.

Finished in gray enamel the Model 2110 has large 13¼-in. dials on both front and back, and an air cylinder control is provided to bring the indicator to rest quickly. The scale is suspended from an overhead support with a swivel type hanger—it may be turned to suit the convenience of the operator. Items to be weighed are held in a large size pan (porcelain or stainless steel). The dial is 10 lb by 1 oz, with maximum scale capacity of 30 lb. Over-all height of scale is 36 in. (For bulletin 1505a describing this scale circle No. 15 on Reader Service Card.) Toledo Scale Co.

16—GLASS BLOCK is light diffusing, for skylights

Skytrol Glass Block is specially designed for use in skylight, both structurally and optically. It is a 12 by 12 in. square block, 4 in. thick, designed to overcome the problems of condensation, glare, heat gain and loss which have long hindered the popularity of skylights. In the Skytrol, the normally good insulating value of the glass block has been increased by the addition of a fibrous glass screen sealed in the block. Manufacturer says that the screen not only gives a better insulating characteristic to the block (U=0.43), but offers better daylighting control by diffusing the light. This screen, along with the block's internal prisms and Soft-Lite edge, serves to assure evenly diffused daylight from the panel of illumination.

Panels of Skytrol can be used in new buildings and to replace existing skylights. According to company, the construction specifications are adaptable to all types of structures. (For information circle No. 16 on Reader Service Card.) Pittsburgh Corning Corp.

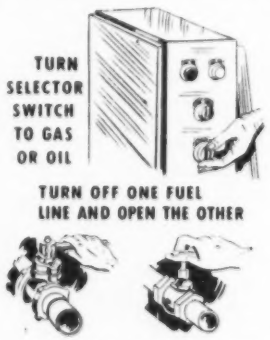
17—INDICATING DEVICE finds, warns of static hazard

The Industrial Staticator has a threefold purpose: to automatically give audible and visual warning whenever static charges build up to a hazardous level; to detect sources of static generation, measure their intensity and determine polarity of static charge; and to eliminate "human equation" from static control.

The Staticator is designed to provide an explosion proof instrument that detects static charges of any intensity. It incorporates a static voltmeter to reflect the existence of any static accumulation, a light and an automatic buzzer to warn of static conditions, a super sensitive guarded probe to tell the intensity and polarity of the charge and location of static, antenna and earphones for use in noisy operations. The instrument is enclosed in an aluminum case with carrying handle; it weighs 14 lb. (For illustrated bulletin circle No. 17 on Reader Service Card.) The John Hewson Co.

18—BOILERS offer quick interchangeability of fuels

Easy, fast changeover from gas to oil, or vice versa, is claimed possible by means of a new development incorporated in this manufacturer's combination gas- and/or oil-fired boilers. These operate on gas with the oil burner in place. No mechanical or electrical change is necessary to change fuels. By simply flipping a selector switch on the control panel, to either gas or oil, the



proper circuit is set into action, it is explained; turning the fuel supply valves completes the changeover.

This development is of special interest to gas users in areas where local requirements demand quick changeover. (For further information, circle No. 18 on Reader Service Card.) Cleaver-Brooks. Co.

19—ILLUMINATOR for flat-glass water level gages

The Yarway Type M Illuminator uses a 100 w sealed-in beam mercury vapor lamp as its source of light. This lamp produces about twice the amount of light for the same power input as an incandescent light, company points out, and the greenish blue color of the light emitted affords better visibility. The over-all effect credited to these factors is a brilliant source of illumination which makes the meniscus at the water level "shine like a star" over the entire length of visibility.

With this type of illuminator water levels are reported to be successfully

transmitted 125 ft—and with the use of a light shield at the gage and suitable ducts this distance can be increased. The mercury vapor rays are also said to penetrate foreign deposits the mica, and to be less affected by extraneous light that often impairs gage visibility. The complete unit consists of the illuminator, shown, plus a small ballast, not shown. The ballast can be plugged into a standard 120-v electrical system. (For descriptive bulletin circle No. 19 on Reader Service Card.) Yarnall-Waring Co.

20—RECONDITIONING SERVICE for worn plastic gloves

Glovco Over-Kote is a new industrial service—the reconditioning and reprocessing of worn and damaged, smooth and rough plastic dipped cotton gloves. This service is available in practically all industrial areas and is said to require about two weeks from pick up to delivery.

The practicability of plastic gloves for wear resistance and better grip is widely recognized. Tests are reported to show that up to 90 per cent of those previously discarded can be reclaimed by this service which includes, cleaning, sterilizing, repairing, reshaping, recoating, vulcanizing and pairing. It is said to provide reusability at a fraction of the cost of new gloves, and claimed to be as workable as the reconditioning of fabric and leather gloves which this company has been doing for several years. (For details circle No. 20 on Reader Service Card.) U. S. Industrial Glove Corp.

(More New Products on page 162)

Fenestra
BUILDING INFORMATION

This can save you over $3,600

The soft-silver-gray object above will never turn black—or red. It is a piece of *steel* that will never need *paint* to protect it from rust.

It is a small section of one of the most rugged, rigid, money-saving windows you can buy—a Fenestra* Super Hot-Dip Galvanized Steel Window.

If yours is a typical plant, these windows can save you about $3,600 every few years in paint and painters.

Fenestra Steel Windows are galvanized in Fenestra's own new plant—the only plant in America especially designed for the exacting job of hot-dip galvanizing steel windows. Only Fenestra has the method, the special deep tanks, the automatic controls necessary to give you windows with this superior protection.

Send for your free booklet on Fenestra Super Hot-Dip Galvanized Steel Windows—write Detroit Steel Products Company, Dept. PE-3, 2280 E. Grand Blvd., Detroit 11, Mich.

*℗

BEND TEST shows why Fenestra Steel Windows are called Super Hot-Dip Galvanized. When two pieces of galvanized steel are bent, then straightened, some types of galvanizing crack open, leaving the steel vulnerable. The Fenestra piece *stays* protected.

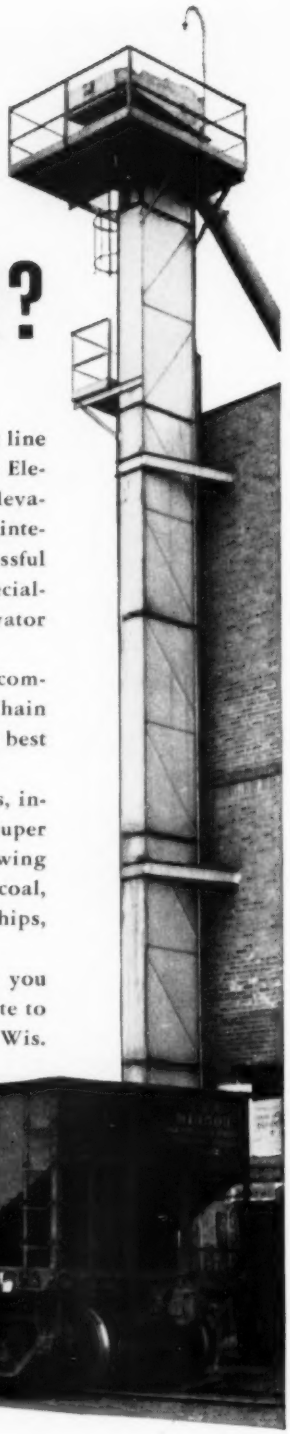
Fenestra

SUPER HOT-DIP GALVANIZED STEEL WINDOWS

from the only plant in America especially designed to Hot-Dip Galvanize steel windows

For more facts circle 588 on Reply Card

looking for a BUCKET ELEVATOR?



They're easy to find—when you make the complete Chain Belt line your starting point. Here, you'll find a standard Rex® Bucket Elevator to meet virtually every type of requirement. You'll find elevators that are dependable, long lived, that require very little maintenance. You'll find a design that has been proved by years of successful operation in almost every industry. And you'll find trained specialists—men who devote themselves exclusively to bucket elevator problems—ready, willing and able to help you all they can.

Remember, too, that in a Rex Bucket Elevator all the major components—buckets, chains, sprockets, housing—are made by Chain Belt Company . . . just one more reason why you're sure of the best when you specify Rex.

Rex Bucket Elevators are made in a wide variety of designs, including Centrifugal Discharge type, Continuous Bucket type, Super Capacity type. They can handle virtually every type of free flowing material. Here's a list of some of the most commonly handled: coal, cement, gravel, crushed limestone, salt, sand, sugar, wood chips, soda ash, pebble lime, foundry sand.

Your Rex Field Sales Engineer is well qualified to advise you about the best elevator for your needs. Call him today or write to Chain Belt Company, 4777 W. Greenfield Ave., Milwaukee 1, Wis.

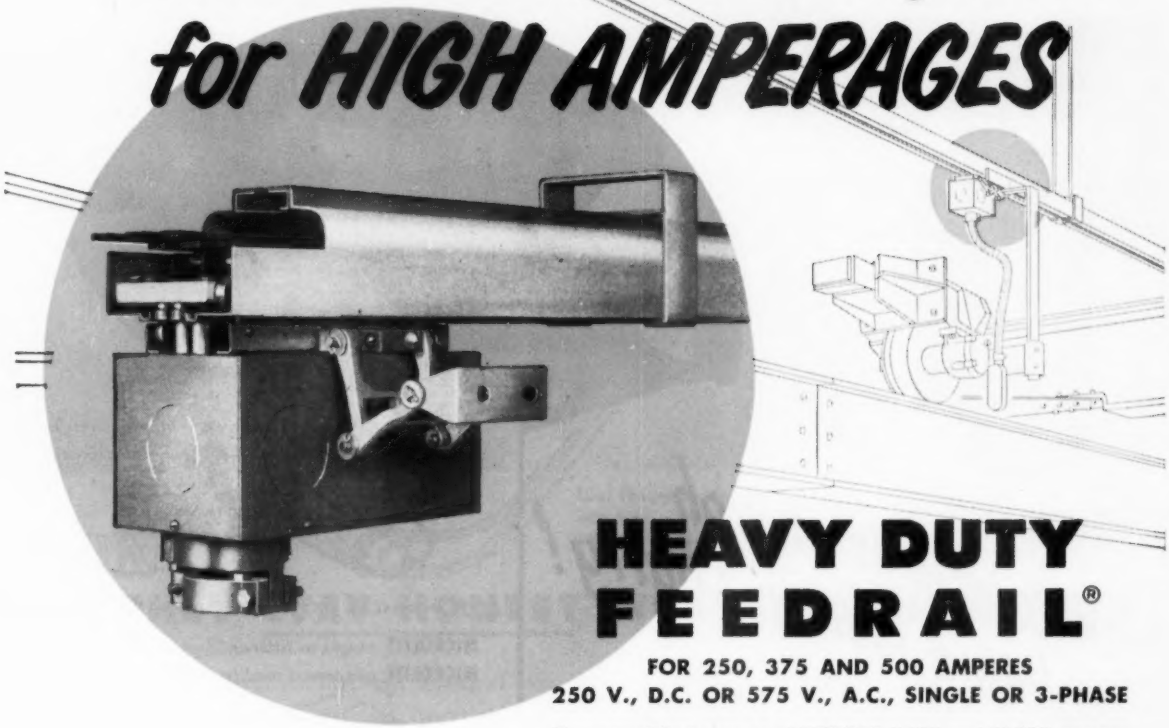
CHAIN BELT REX COMPANY®

Chain Belt COMPANY OF MILWAUKEE

Atlanta • Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Dallas Denver • Detroit • El Paso • Houston • Indianapolis • Jacksonville • Kansas City • Los Angeles Louisville • Midland, Texas • Milwaukee • Minneapolis • New York • Philadelphia • Pittsburgh Portland, Ore.• Springfield, Mass.• St. Louis• Salt Lake City• San Francisco• Seattle• Tulsa• Worcester

For more facts circle 589 on Reply Card

NOW—a completely standardized mobile electrification system for HIGH AMPERAGES



HEAVY DUTY FEEDRAIL®

FOR 250, 375 AND 500 AMPERES
250 V., D.C. OR 575 V., A.C., SINGLE OR 3-PHASE

The unqualified success of FEEDRAIL "60" and "100" ampere systems of mobile electrical distribution has led to many requests for the same system in higher amperages.

These were formerly handled on a "special order" basis. Now, as the result of years of satisfactory service and the heavy demand, 250, 375 and 500 ampere "Heavy Duty" Systems have been made a part of the regular Feedrail line. They are available in standardized track sections, trolleys and accessories.

"HEAVY DUTY" FEEDRAIL is not an adaptation of a lighter capacity system. Every one of its standardized components is designed and proportioned expressly for high amperage and heavy duty service.

Existing applications include freight car icing machines — big tonnage hoists and cranes — large machine tools, etc.

Write for descriptive literature

Sold by leading electrical distributors

HEAVY DUTY FEEDRAIL FEATURES

MAXIMUM SAFETY—*Enclosed conductors eliminate dangers of exposed wiring.*

EASE OF INSTALLATION—*Standardized units fit together easily. No special tools are needed.*

ADAPTABILITY—*Easy to extend, modify or move reusing all components of existing system.*

MOBILITY — *Trolley power outlets move with the electrical load.*

LOW MAINTENANCE—*Simple periodic cleaning and lubrication is all that's needed.*

52-5 Rev.

ELECTRIC FEEDRAIL®

Never Becomes Obsolete

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET • NEW YORK 7, N. Y.

SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES

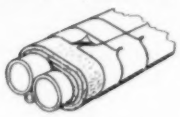
For more facts circle 590 on Reply Card

How to wrap up a tough insulating job... in a hurry!

MICROLITE *Glass Fiber Insulating Wool* goes around this air conditioning duct with the greatest of ease. The men simply snip off a section of the feather-light blanket, pull it snugly around the duct, and secure it with glass tying cord. A single, simple wrap-around operation—and the duct is well insulated against heat loss or gain. Microlite comes to you in resilient blankets up to 72 inches wide, 200 feet long, 3 inches thick, compressed in easily-stored rolls.

You can't conscientiously proceed with any insulating job until you've investigated Microlite, a product of Glass Fibers' exclusive electronic-extrusion process. Write for the facts. Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

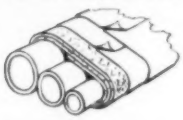
MICROLITE *insulates effectively against heat transfer.*
MICROLITE *is pleasant to handle, cuts with scissors.*



STEAM-TRACER LINES

VALVES AND FITTINGS

MICROLITE *weighs as little as ½-pound per cubic foot.*
MICROLITE *compresses readily, springs back fully.*



NESTED PIPES

DOMESTIC BOILER

MICROLITE *is shipped in space-saving compressed rolls.*
MICROLITE *is an excellent absorber of unwanted noise.*

WARM AIR FURNACE

AIR CONDITIONER

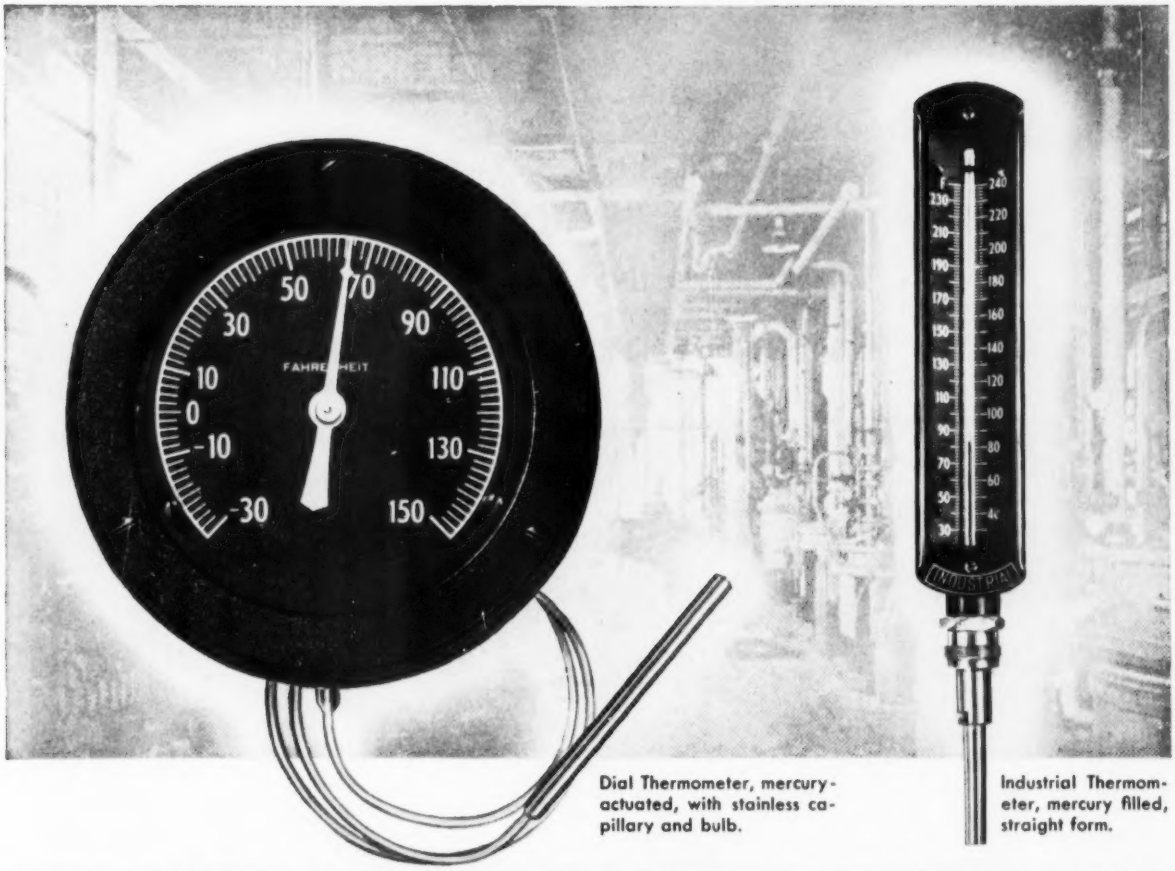
MICROLITE *is inorganic, resists fire and moisture.*
MICROLITE *is tough, withstands rough handling.*

GLASS FIBERS INC.

Makers of glass fibers by the ELECTRONIC-EXTRUSION process . . . developed, patented and used exclusively by Glass Fibers Inc.

VITRON Yarns • Rovings • Micro-Fibers • Pipe Wraps • Industrial Mat • DURAMAT Vapor Barriers
VIBRAGLASS Machinery Mounting and Packaging Materials • COUSTIC-AIRE and THERMO-JET Aircraft Insulations

For more facts circle 591 on Reply Card



Dial Thermometer, mercury-actuated, with stainless capillary and bulb.

Industrial Thermometer, mercury filled, straight form.

WILL THEY STAY HONEST WHEN THE HEAT'S ON?

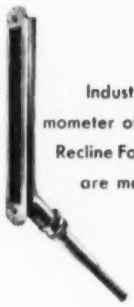
Rigid quality control and thorough testing of every USG Thermometer under actual operating conditions say *they will!*

So does the fact that USG sells no makeshifts. Regardless of your process or application, there's a USG Thermometer that suits it precisely. You may choose Industrial Types in all sizes, and mounting forms with standard or protected stems —or Dial Types in a variety of sizes, case styles, mountings, ranges and connections. *All* USG Thermometers—gas, mercury, or vapor-actuated—are built to the same high quality standards as USG Pressure Gauges!

If you're interested in typical applications of commercial and approved Navy Standards, dimensional information and the use of bushings, flanges, sockets and special tubing, send for Catalogs 100 and 200.

Special thermometers for dough testing, milk testing, fuel gas, candy, solder baths, varnish, canning, vulcanizing and other unusual processes.

Dial Thermometer with bottom-connected rigid stem, one of many USG types available.



Industrial Thermometer of the 45° Recline Form. There are many other standard forms.

UNITED STATES GAUGE

United States Gauge
Division of American Machine and Metals, Inc.
Sellersville, Pa.

Gentlemen: We are interested in USG ☐ Industrial Thermometers; ☐ Dial Thermometers. ☐ Please send us your catalog. ☐ Have your man call. No obligation, of course.

Name _____ Title _____

Company _____

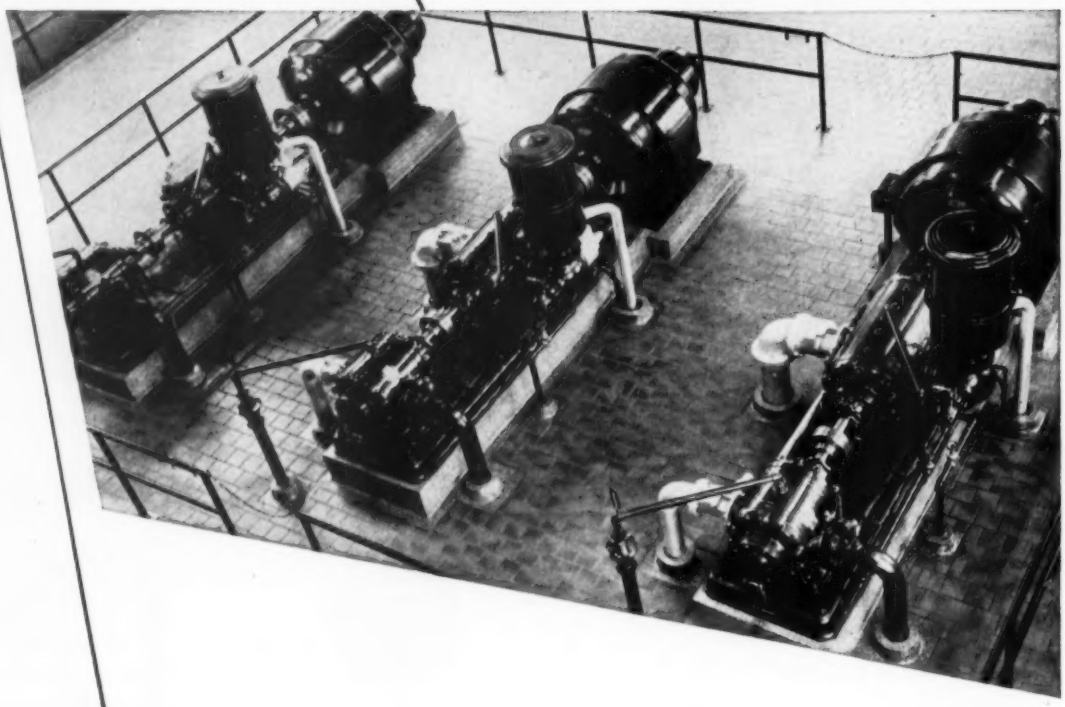
Address _____

City _____ Zone _____ State _____

For more facts circle 592 on Reply Card

YOU ELIMINATE
HEAVY FOUNDATION COSTS
WHEN YOU INSTALL

Fuller Rotary Compressors



You eliminate heavy concrete foundations when you install Fuller Rotaries . . . even with the larger capacity machines . . . because with rotary there is no vibration. The battery of three Fullers shown above, having a capacity of 1085 c.f.m. each, at 100-lb. pressure, are mounted on comparatively light terrazzo foundations . . . and they're on an upper floor of the building. The installation is compact, streamlined, and efficient in operation.

Not only do you save in foundation costs, but Fullers have many other inherent advantages. They're simple in design, are easily operated, ruggedly built. And, they give you a *maintained capacity for the life of the machine.* They've *earned* their reputation for complete dependability.

Bulletin C-6 illustrates and describes these quality compressors . . . send for your copy today, and see how they will fit into your own plans and operations.

FULLER COMPANY, Catasauqua, Pa.
120 So. LaSalle St. • Chicago 3
420 Chancery Bldg. • San Francisco 4

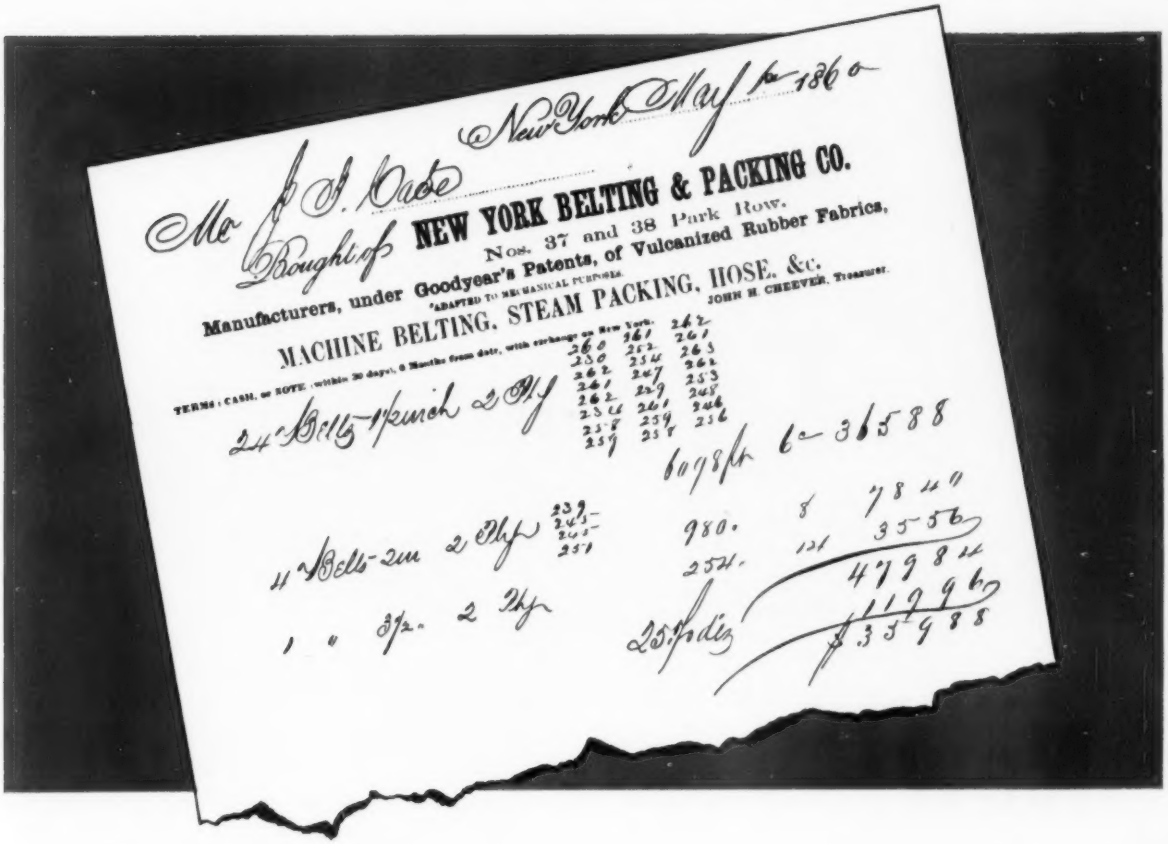
C-228

Fuller

PIONEERS OF HIGH-EFFICIENCY VANE-TYPE ROTARY COMPRESSORS

For more facts circle 593 on Reply Card

In the year 1860


NEW YORK BELTING & PACKING CO.
Nos. 37 and 38 Park Row.
Manufacturers, under Goodyear's Patents, of Vulcanized Rubber Fabrics,
MACHINE BELTING, STEAM PACKING, HOSE, &c.
JOHN H. CHEEVER, Treasurer.

In the year 1860, Mr. J. I. Case of Racine, Wisconsin, manufacturer of farm equipment, bought flat, narrow belting from New York Belting & Packing, as recorded by the above invoice.

Today, 92 years later, the company founded by Mr. Case, a nationally-known organization outstanding in its field, is still an enthusiastic user of NYB&P products.

Such long-continued association is not unique among NYB&P customers. It stems not only from the excellence of NYB&P products, but also from the fine service rendered by NYB&P Distributors. These key men are always ready in emergencies, always helpful with practical assistance and advice for any and all types of industrial operations.

NEW YORK BELTING & PACKING CO. • Founded 1846

NEW YORK BELTING & PACKING CO.

America's Oldest Manufacturer of Industrial Rubber Products

1 Market Street, Passaic, New Jersey

For more facts circle 594 on Reply Card

New!

Type NPLAB plug-in breaker panelboards

1. Smaller, more compact—lighter in weight.
2. Ample wiring gutters—nothing less than four inches.
3. New type wire terminal does away with wire looping on branch breakers.
4. Snap-on covers over neutral bar and main lugs provide quick access for wire connections.
5. Identification of breaker bussing is instant and permanent—during and after installation. Takes the guesswork out of load balancing.

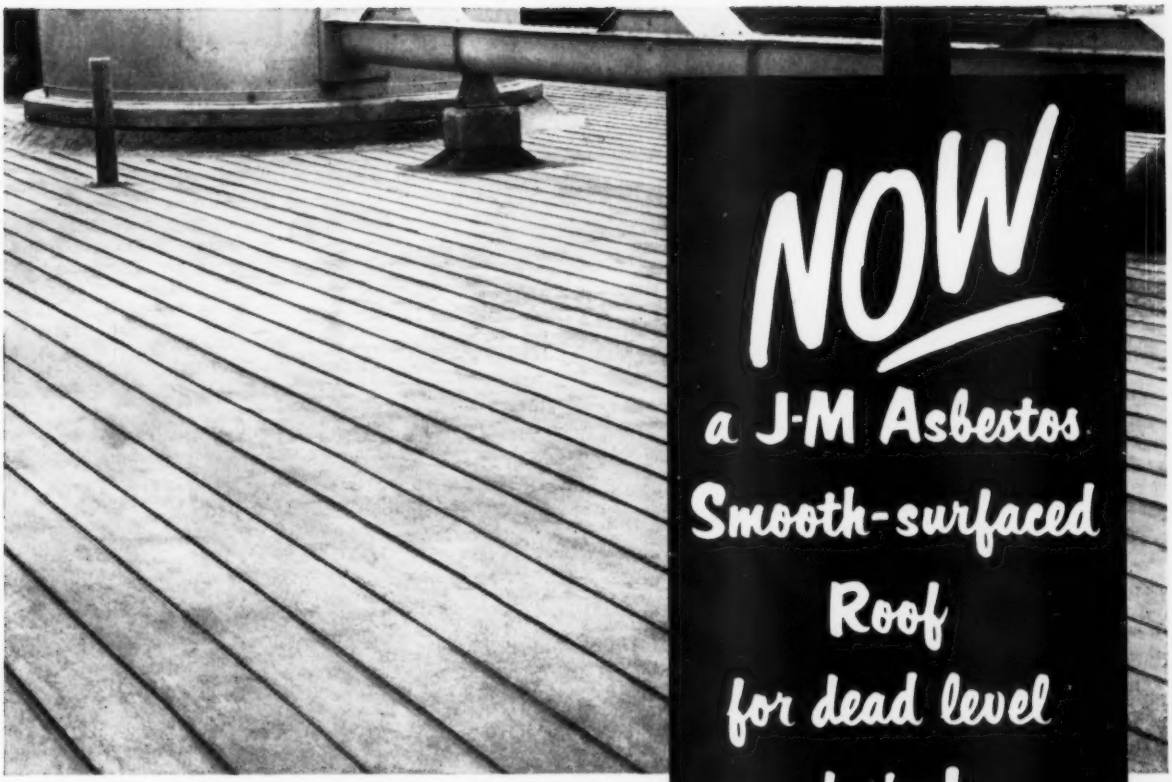
Quality in a panelboard—in design and construction—makes for better circuit protection. Look to Westinghouse.

Call your Westinghouse representative, or write for Panelboard Book B-5644, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. J-93496

YOU CAN BE SURE...IF IT'S Westinghouse

APPARATUS DISTRIBUTOR WESTINGHOUSE

For more facts circle 595 on Reply Card



NOW
a J-M Asbestos Smooth-surfaced Roof for dead level decks!

The Johns-Manville Flexstone *Special* Built-Up Roof...

THE J-M Asbestos FLEXSTONE* SPECIAL Roof has been developed for decks from dead level to ½" pitch per foot. It is the result of extensive experimentation in the Johns-Manville Research Center and years of successful tests in the field. Now for the first time you can utilize the proven advantages of the well-known J-M Flexstone Asbestos Roof *on flat or nearly flat decks.*

Smooth-surfaced to afford good drainage and make maintenance and repairs easier!

No gravel or slag—cuts down excess weight and saves labor costs!

Made of asbestos—J-M Flexstone Felts are made of fire-rot-and weatherproof asbestos. They last longer and give more enduring protection.

Won't dry out—Because they are made of mineral asbestos, Flexstone Felts are unique in their resistance to the destructive effect of sun!

For your added protection, the Johns-Manville Asbestile* System of Flashing insures proper treatment of all critical areas. Asbestile is a heavy-bodied plastic cement designed for use with asbestos flashing felts to give thorough water-tightness. As it sets, Asbestile forms an integral part of the wall itself.

Flexstone Roofs are applied only by J-M Approved Roofers. For full information on Flexstone Roofs and Asbestile Flashing Systems, send for brochure BU-68A. Write Johns-Manville, Box 158, Dept. PE, New York 16, N. Y.

*T. M. Reg. U. S. Pat. Off.

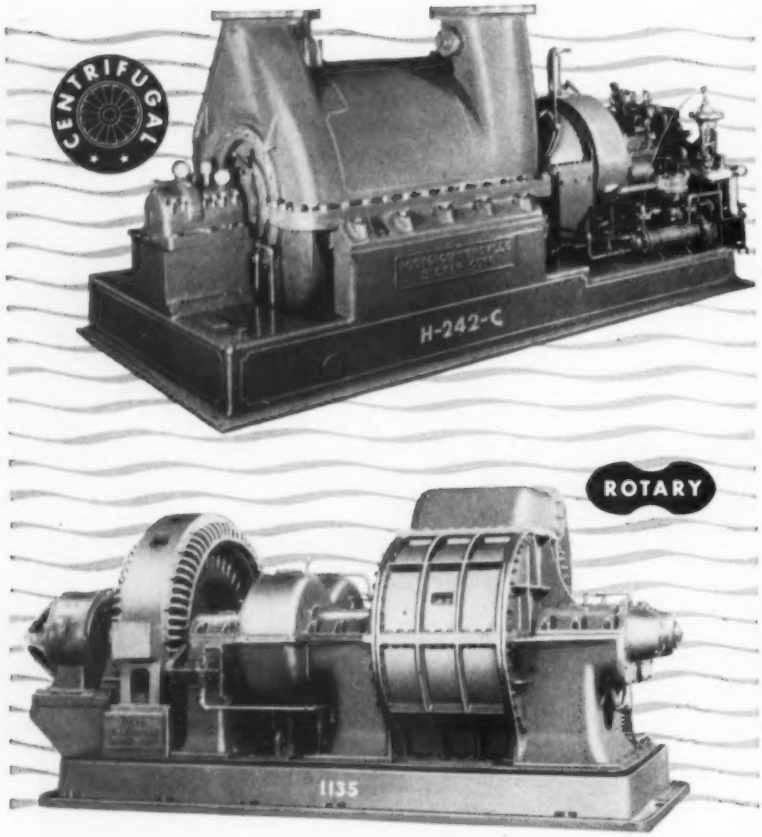
JOHNS-MANVILLE JM PRODUCTS

Made of ASBESTOS

Johns-Manville FLEXSTONE* Built-Up Roofs

ASBESTOS CORRUGATED TRANSITE* • ACOUSTICAL CEILINGS • DECORATIVE FLOORS • MOVABLE WALLS • ETC.

For more facts circle 596 on Reply Card



BLOWER RELIABILITY A "NATURAL" WITH AIR-MINDED *Specialists*

The long record of reliability established by Roots-Connersville Blowers, Exhausters and related equipment is the natural result of almost a century of experience in the exclusive business of handling gas and air for industrial purposes.

But its more than just designing and building *a* piece of machinery. Such user satisfaction comes also from the wide range of capacities and types, from which the right unit can usually be selected. Especially important, our *dual-ability line* of Centrifugals and Rotary Positives enables us to make unbiased recommendations . . . a *dual choice* available only from Roots-Connersville.

Whatever your need may be in the handling of air or gas for industrial purposes, you can look to Roots-Connersville for unquestioned reliability and long-time economical performance. Ask us for specific recommendations on any problem of handling gas or air—in any quantity.

ROOTS-CONNERSVILLE

Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER

A Division of Dresser Industries, Inc.
353 Planton Ave. · Connersville, Indiana

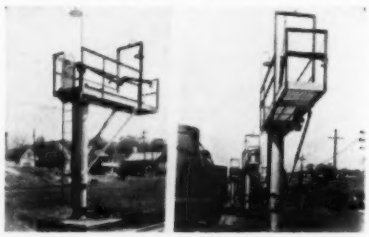
For more facts circle 597 on Reply Card

NEW PRODUCTS

(Begins on page 148)

21—SAFETY PLATFORMS for railroad tank car loading

The Safety Tank Car Platform is intended to eliminate standing on the curved slippery top of a railroad tank car during loading and unloading operations. This platform is supported on a steel column bolted upright to a concrete base alongside the tracks. From the grated deck of the platform the operator can turn the platform 360 deg, stopping at any angle over the top of the tank car. He can service cars on each side of the platform when platform is between two sets of tracks. With the platform in position over the



car the operator can open the top, insert the loading pipe and couple it up without stepping on the car.

The platform rides on roller bearings so it is easily turned by the hand crank wheel on the platform which is geared to the supporting steel column. In order to turn the platform the operator must hold down a foot brake which holds the platform stable in the stopped position. When not in use a bolt lock holds the platform in a safe position parallel to the tracks and out of the way of passing cars.

Piping on the platform is supported by adjustable chains attached to overhead bracing; it leads down through the supporting column, underground to storage tanks. (For details circle No. 21 on Reader Service Card.) Nichols Engineering Co.

22—INDUSTRIAL OVERSHOES are light in weight, tough

These neoprene rubbers are designed especially for wear by men who work around oils, solvents, acids and other chemicals. Neoprene's resistance to oils and chemicals is said to make the new overshoes suitable for use in creameries, chemical plants, refineries, paper mills.

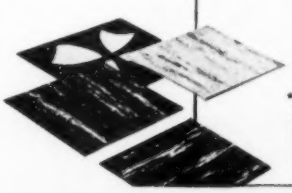
The overshoes are unusual in that they have no fabric lining. Tests are reported to show that omission of the fabric exacts no sacrifice in durability and does result in important advantages to both wearer and plant storekeeper.

To the wearer, these advantages are lightness and comfort. The rubbers weigh only 9 oz apiece and the elasticity of the neoprene upper provides a firm grip on the shoe to prevent pulling off at the heel. And if the rubbers get too dirty inside, it's a simple matter to turn them inside out and sponge them off. To the storekeeper, stretch-

Should flooring problems be dropped on the company president's lap?

FLOORS can be a sound investment—or an overly-costly expenditure—depending on how well suited they are to the area where used. For example, a corridor requires certain qualities in a floor ... cafeterias present totally different flooring problems ... basement utility rooms must meet still other standards.

And, because maintenance costs, public approval and over-all profits are affected, you'll benefit by calling in a Kentile Flooring Contractor—to make sure the floors you choose are the right floors ... the floors that will last the longest ... look the best ... for the smallest cost.



Call the Kentile Flooring Contractor* for up-to-date information about these floors

- ✔ *KENTILE ASPHALT TILE*
- ✔ *KENRUBBER TILE FLOORS*
- ✔ *KENFLEX VINYL TILE*
- ✔ *KENCORK FLOORS & WALLS*
- ✔ *SPECIAL greaseproof KENTILE*

KENTILE INC.

***If you don't know the name of your Kentile Flooring Contractor look under FLOORS in your Classified Phone Directory or write Contract Dept., Kentile, Inc., 58 2nd Ave., Brooklyn 15, N. Y.**

For more facts circle 598 on Reply Card

SCALES CONTROL COSTS

Check your needs now!

Production-wise and cost-wise . . it makes good cost sense to be sure you have enough scales—and the right scales—throughout your plant today!

A scale survey by your nearby Toledo office will supply this information for you—without obligation. It will point out *proven ways* to solve your problems in weighing, checking, testing, counting, batching, force-measuring and other operations . . . with a modern Toledo! Learn how Printweigh can stop the losses that occur through human errors. It will pay you to get in touch with your Toledo office—in the phone book in 200 cities. Or write for bulletin 2020, a condensed catalog of modern Toledos. Toledo Scale Company, Toledo 1, Ohio.

SERVICE
Factory-Trained
200 Cities

TOLEDO®

HEADQUARTERS FOR SCALES

For more facts circle 599 on Reply Card

NEW PRODUCTS

(Begins on page 148)

ability of the overshoes is their main advantage because only three sizes—small, medium and large—need be stocked to take care of shoe sizes. (Circle No. 22 on Reader Service Card.) E. I. duPont de Nemours & Co.

23—LUBRICATOR for bearings, spindles and gear boxes

This new Micro-Fog Lubricator is specially designed to produce an extremely fine and uniform oil fog at low air flow. Features announced for it include a constant oil level; 360 deg visibility of oil flow; accurate metering of oil delivery into air line to as little as 1 drop in 20 min by means of air control; universal right to left or left to right flow without adjustment. It is also designed to provide full view of the oil supply, to cool as it lubricates high speed rotating parts and permit greater oil fog travel. The lubricator is for ¼ in. air lines. Rated air requirements range from 0.8 cfm at 10 psi to 6 cfm at 80 psi. Maximum safe operating pressure is 150 psi, maximum safe temperature 120 F. (For complete data circle No. 23 on Reader Service Card.) C. A. Norgren Co.

24—STRIPPING METHOD gets paint off conveyor parts

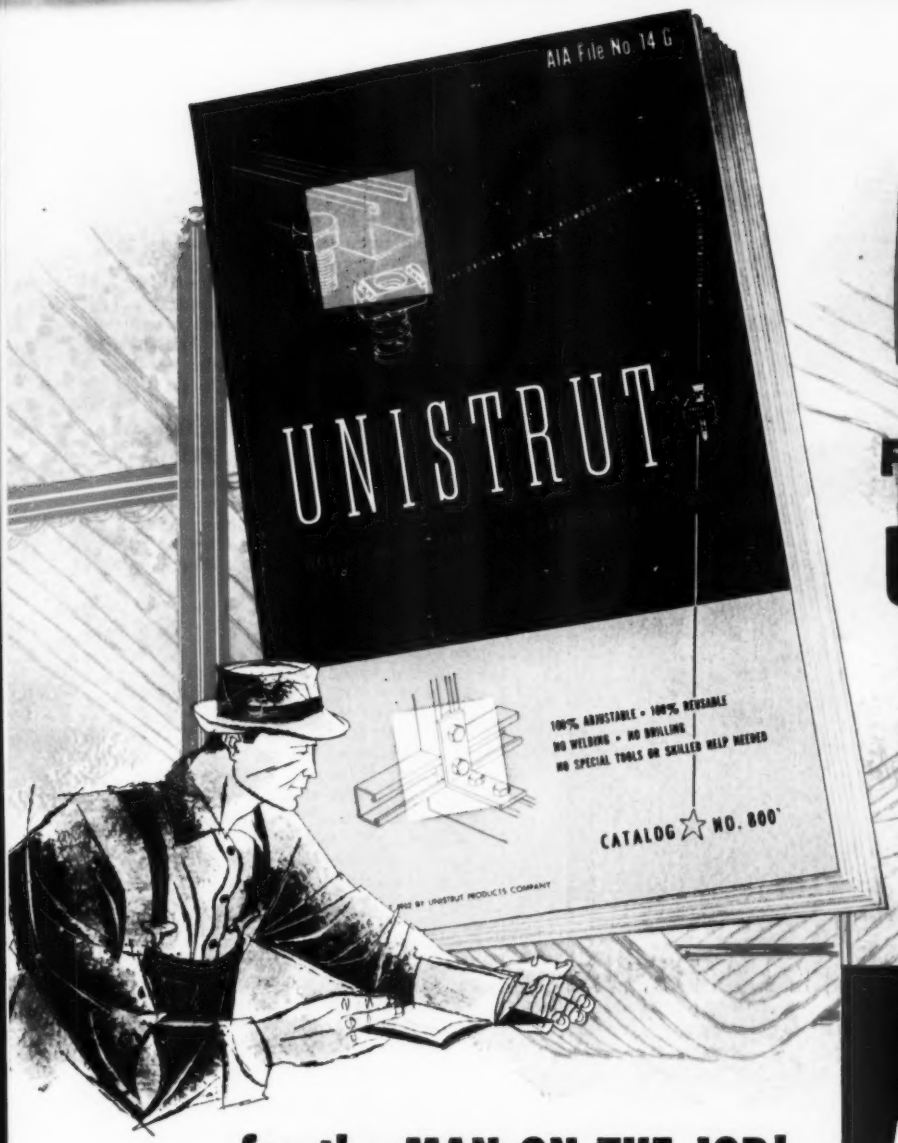
A new stepped-up method of stripping paint from conveyor hooks, hangers and other conveyor line handling equipment, as well as paint rejects, is announced. It involves the use of new stripping chemicals and is said to permit making the job a regular production conveyor line operation.

The procedure provides for running the conveyor line hangers etc, through a tank of the one-step stripper at a given point. Before reaching this stage, finished work pieces are removed, and accumulated rejects placed on the line to be stripped along with the equipment. Tests are reported to show savings in time up to 90 per cent with this high-speed stripper, which can also be applied by production spray methods. (For details circle No. 24 on Reader Service Card.) Klem Chemicals, Inc.

25—DRAFTING TABLE has adjustable-height top

The Tec-Table offers several features—an adjustable top, storage space and easy storage of the table itself when not in use. The Tec-Table can be used with an ordinary chair, as well as with a stool of usual height, since its top is adjustable from 30½ to 41 in. above the floor. The top may also be tilted in either direction or made level. The top is 3 ft by 6 ft, with an anodized aluminum molding for a straight edge.

On the right side of the table is hinged an all-purpose palette table with two sliding shelves for supplies. A large shelf for reference material is built into the front of the table, so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100% ADJUSTABLE • 100% REUSABLE
NO WELDING • NO DRILLING
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New FREE 84 PAGE UNISTRUT® Pocket Catalog NO. 800

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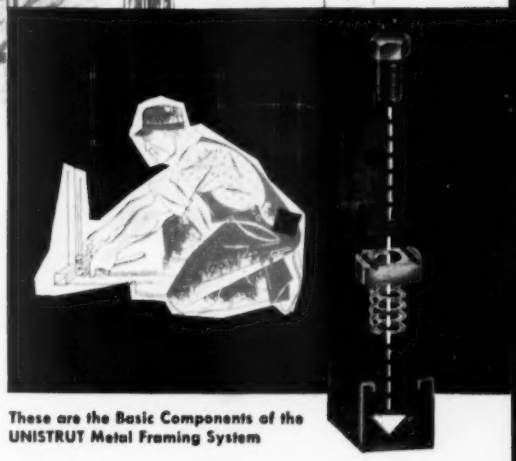
84 pages crammed with ideas, pictures and data on how to frame, hang, support and mount all kinds of mechanical and electrical equipment with adjustable UNISTRUT All-purpose Metal Framing.

Perfect for the man on the job—most useful, too, as a handy reference catalog for the architect, engineer, draftsman, contractor, or builder. Just pocket size, easy to handle, always within reach when you want it. Order your free copy of the *NEW* UNISTRUT Catalog No. 800 today! With UNISTRUT channel and fittings you can build all types of conduit, cable, pipe and tubing hangers and supports, framing, mounts, racks, tables, benches, and many other structures with just a hacksaw and a wrench. No drilling, no welding, 100% adjustable and re-usable.

The UNISTRUT system of mechanical supports provides great strength without bulk. It's easy to work with, lasts indefinitely, and the finished structure assures neat and orderly appearance.



These are the Basic Components of the UNISTRUT Metal Framing System

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Other Patents Pending

The World's Most UNISTRUT **Flexible All-Purpose Metal Framing**

Distributors and Warehouse Stocks in Principal Cities—Consult your Telephone Directories

MOBILIFT "Stand-Ups" Stand Out!

MOBILIFT *Stand-Up* type Fork Lift Trucks *Stand Out* for efficient, low-cost materials handling in warehouses, terminals and plants because they get more work done faster.

Here's Why:

1. The operator gets on and off an ample size platform in a second or two. He works on his feet, has maximum all-around visibility.
2. MOBILIFTS are agile. Compact design, short over-all length, and MOBILIFT 360° steering mechanism makes ZERO inner turning radius and 57" outer turning radius possible (2,000 lb. model "E"). MOBILIFTS are long-time favorites for close, congested working areas.
3. LEV-R-MATIC push-pull controls speed all movements. NO GEARS TO SHIFT... push-pull levers for forward-back movement, elevating and tilting.
4. MOBILIFT air-cooled 3-cylinder engine delivers abundant, reliable power. Compact, precision-balanced, accessible for economical operation with minimum repair and service.

Let a MOBILIFT Sales Engineer show you why MOBILIFT *Stand-Ups* in your business will *Stand Out!* Write or wire MOBILIFT for complete information today. *No obligation,*

MOBILIFT Lev-R-Matic DRIVE

MOBILIFT CORPORATION

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1113 Spring St. N. W., ATLANTA · 2724 Taylor St., DALLAS
2730 San Pablo Ave., BERKELEY

For more facts circle 601 on Reply Card

NEW PRODUCTS

(Begins on page 148)

that when the tables are used in tandem, the man at the front table uses the shelf of the one behind him.

When disassembled, the table stores in a carton only 3 in. thick by 3 ft by 6 ft. It is shipped disassembled, ready to be put together with hammer and screw driver. Standard model is white pine plywood, sells for $79.95 FOB factory. (Circle No. 25 on Reader Service Card.) Tectonic Services, Inc.

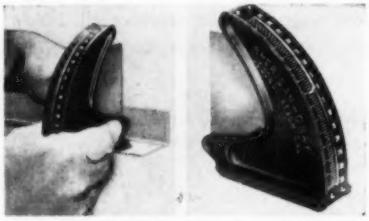
26—SEALER for application of active-solvent coatings

Consisting of carefully selected synthetic resins and a special combination of leafing-type metallic pigments, Prufcoat Sealer P-25M air dries by the simple evaporation of volatile solvents chosen to have a minimum effect on conventional oil paints, asphalt coatings and similar materials. It is said to form an effective barrier film over surfaces which might otherwise be lifted or wrinkled by the active solvents in vinyl and other synthetic resin coatings, and to be an excellent anti-staining sealer over tar, oils and pitch.

Among suggested uses are applications in which asphalt, coal tar and similar coatings are already on the surface, and instances where heavy mastic-type coatings are in use because of their combined insulation and chemical resistance properties and it is desired to apply chemical-proof top coats in keeping with a particular color scheme, including white. When kept on hand as a stock item this sealer can solve many special painting problems as they arise. (For Technical Bulletin 023 circle No. 26 on Reader Service Card.) Prufcoat Laboratories, Inc.

27—PROTRACTOR measures angles on sheet metal

Called an Angle-Chek, this new inspection tool permits quick checking of angles on parts formed by equipment



such as hydraulic presses and brakes. Accuracy is said to be within ± 5 min. List price is $14.95. (Circle No. 27 on Reader Service Card.) Sheridan-Gray, Inc.

28—ALL-PURPOSE SEAL for rotary shaft applications

Here's an all-purpose mechanical seal, the John Crane Type 19, designed for long service in small pumps, hot water circulators, and other rotary shaft applications. Beveled cones made of Teflon (DuPont trademark for tetra fluoro-

Whether
DUST REMOVAL
or
MATERIALS HANDLING

You can install SPIRATUBE® yourself

Whether your application requires dust removal . . . or materials handling . . . you can set up your lines of SPIRATUBE to meet your requirements. AND . . . what's more important — you can do it yourself. That cuts downtime to a minimum, and enables you to keep your ducting system in operation to meet your production needs.

SPIRATUBE — the new type flexible tubing — connects quickly, easily to your present lines . . . and bends anywhere with minimum crimping. No turn is too short, no angle too acute. No elbows or special fittings to bother with in going around obstructions!

And — important to you too: The initial cost of SPIRATUBE is small . . . and its life equals — sometimes exceeds — rigid ducts.

Standard sizes for all requirements are immediately available from well-stocked distributors — coast-to-coast.

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For more facts circle 602 on Reply Card

. . . THEN WE INSTALLED ALGRIP

Thus Doubling Production Efficiency And Lowering Big Insurance Costs

In a large Eastern rolling mill, a ramp from the production floor to a storage area above was so slippery from oil and grease drippings that a fork-lift truck could not climb the incline by itself. An unloaded fork-lift truck had to push the loaded one. Already a safety hazard, the slippery ramp also caused production inefficiency.

INCREASED: Production efficiency by more than 50%

LOWERED: Accident insurance premiums to save thousands of dollars.

When A.W. ALGRIP Abrasive Rolled Steel Floor Plate was installed on the ramp, skidding stopped, accidents were eliminated, and one truck did the job better than two did before. *Greater production efficiency and lowered insurance rates paid for the ALGRIP installation.* Safe for vehicles as well as men, ALGRIP gives even steep inclines a hard-gripping, anti-skid surface.

In ALGRIP, tough abrasive particles (the same as used in grinding wheels) put hundreds of tiny safety brakes in every footstep—making it virtually impossible to slip. ALGRIP never wears smooth—heavy use only exposes new abrasive particles. The tough rolled steel in ALGRIP makes this floor plate stronger than other abrasive floorings. For safety that pays for itself, get the complete ALGRIP story by writing today for our new Booklet AL-7 —without obligation.

At your request, an Alan Wood Steel Company safety engineer will call on you to show you how ALGRIP can be profitably used in your plant to lower insurance rates, raise production, and eliminate accidents.

Over 125 Years of Iron and Steel Making Experience

ALGRIP Abrasive Rolled Steel Floor Plate

ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

Other Products: A. W. SUPER-DIAMOND Floor Plate • Plates • Sheet • Strip (Alloy and Special Grades)

A.W.

For more facts circle 603 on Reply Card

NEW PRODUCTS

(Begins on page 148)

ethylene resin) are utilized as the flexible member to make the seal adaptable for services involving water, oil, corrosives or acids; temperatures from -100 to 450 F, vacuums and pressures to 200 psi; and high shaft speeds.

A packaged type unit, the seal is available in sizes to fit shaft diameters of ¼, ⅜, ½, ⅝ and ¾ in. Metallurgy of the seal—bronze, stainless steel etc. —can be specified to meet service or operating conditions. (For engineering data circle No. 28 on Reader Service Card.) Crane Packing Co.

Use the Reader Service Cards on pages 35-36 and 197-198 to ask for more information on these products. Circle item numbers of products in which you are interested.

29—PACKAGED WATER CHILLER ready for installation

This new "cold generator" is expected to contribute to lowering both cost and upkeep of medium-size air conditioning systems. It is designed to provide a single-unit source of large quantities of cold water for air conditioning and refrigeration systems requiring between 10 and 50 tons of cooling. It requires only water and electrical connections for installation; compressor, condenser, liquid cooler, controls, motor and accessories are "packaged" in a single factory-assembled unit.

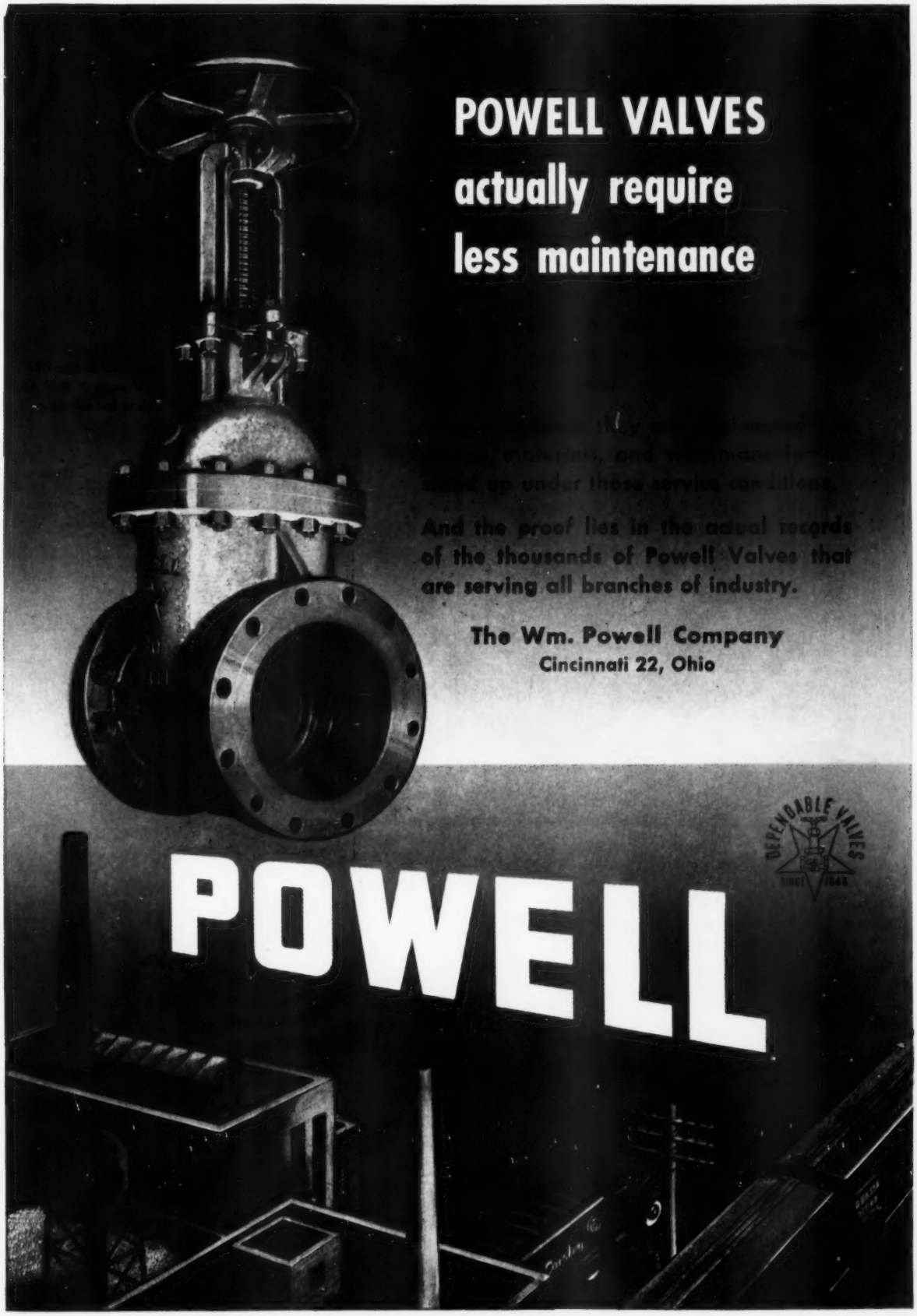
Savings in upkeep and operating cost are credited to the basic design of unit, and to use of company's multi-step reciprocating compressor. Power and water consumption is automatically adjusted to the demand for cooling in regular stages.

The unit will be made in six sizes with capacities from 10 to 50 tons of refrigeration, for both air conditioning and industrial processing applications. It is described as particularly well suited for use where varying demands for cooling of different spaces are met by the unit in systems which circulate chilled water in the summer, and hot water or steam in the winter to individual zone air conditioning units. (For information circle No. 29 on Reader Service Card.) The Trane Co.

30—FORK LIFT TRUCKS are gasoline or diesel powered

These new fork lifts are rated 5000-lb capacity at 24-in. load center, and available in standard lift heights of 72, 84, 108, 114 and 120 in. The Model FTD50-24 is powered by a heavy-duty diesel engine, and the Model FT50-24 by a heavy duty gasoline engine.

Featuring modern styling, these trucks have a "wide-open" design in which side panels, rear and top can be


POWELL VALVES
actually require
less maintenance
And the proof lies in the actual records of the thousands of Powell Valves that are serving all branches of industry.
The Wm. Powell Company
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DEPENDABLE VALVES
POWELL

For more facts circle 604 on Reply Card

Use 'em over and over again

for

DROP-TIGHT CLOSURES!

Dart's True Ball Joint Makes the Difference

Dart Unions are leakproof on the pipeline and on the pocketbook. They're spherically ground to a true ball joint with wide, true-bearing surfaces. Because seats *stay* unscarred and true, these unions won't leak—and you can use them on job after job.

QUICK FACTS

- SEATS of special alloy bronze provide high resistance to pitting and corrosion
- BODIES AND NUTS are practically indestructible. They're air-refined, high test iron
- SHOULDERS are tough and heavy — made to take the most violent wrenching

Ask your supplier for Darts. You'll save money and leaks. And, if you do the installing job yourself, you'll save muscle and sweat also!

DART UNION COMPANY
Providence 5, Rhode Island
The Fairbanks Co. — Distributors
Boston·New York·Pittsburgh·Rome, Ga.

DART UNIONS

For more facts circle 605 on Reply Card

NEW PRODUCTS

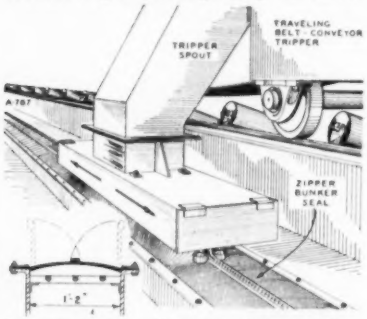
(Begins on page 148)

removed for accessibility to all parts. They have a 12-in. dia clutch which can be changed in 30 min, company points out, a single lever full range gear shift, hydraulic brakes and self-aligning lift cylinder. They can be equipped with cushioned or solid rubber tires. Length (less forks) of the trucks is 88 in.; wheel base is 50 in., and width is 42 in. Trucks are designed to turn in a 71 in. intersecting aisle. (For details circle No. 30 on Reader Service Card.) The Buda Co.

31—BUNKER SEAL to keep the dust from flying

The S-A Zipper Bunker Seal is designed to prevent dust escaping from belt conveyor traveling tripper discharge spouts feeding bunkers. It consists of two zipper toothed seal belt strips and an opening and closing mechanism. The seal is offered primarily for power plant coal systems, but is said to be equally effective in chemical and other industries where traveling trippers are used.

Flat belts are fastened to opposite edges of the bunker opening, their toothed edges meshing along the center



line to form a dust-proof connection. The reversible belt operating mechanism hangs from the tripper spout, with rollers at each end spreading the teeth for easy opening or closing. Rollers are mounted on pantograph frames to maintain proper belt contact at all times. A metal shield on the tripper chute completes the seal. Manufacturer says additional horsepower required to operate the seal is less than 0.2 for typical tripper speeds. Grate bars are provided under the seal belts to protect the operator from accidental injury due to stepping on or through the belts. (For Bulletin 952 on the seal circle No. 31 on Reader Service Card.) Stephens-Adamson Mfg. Co.

32—SUDDEN PRESSURE RELAY for power transformers

Designed to protect power transformers from internal faults, this new sudden pressure relay operates on rate of change of pressure. It is not affected by pressure changes common to transformer operation, company points out, and is more sensitive to small faults

a good address

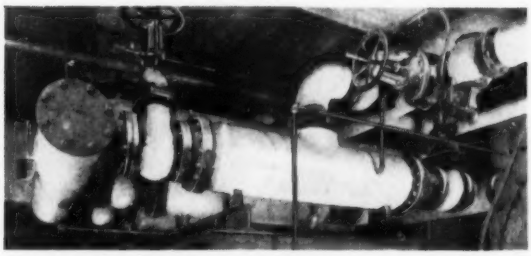
Rittenhouse Claridge
Philadelphia

where p-k equipment is at home.....at work

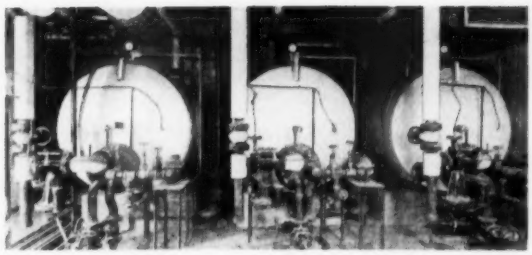
This new, modern apartment house is well equipped to supply its 482 tenant-families with adequate heat and clean, hot water—and the same **p-k** equipment keeps pavement areas free of snow in winter time. Like many other modern apartment owners, **p-k** equipment was chosen by the owners of the Rittenhouse-Claridge for efficient, dependable, economical operation.

Full information and engineering help is yours for the asking. Write today.

Twenty-five story, 482-family Rittenhouse-Claridge apartment building, Philadelphia. Owners: M. H. McCloskey and Kevy K. Kaiserman; Builders: McCloskey & Co., Architects: J. Raymond Knopf, Samuel I. Oshiver, J. Ethan Fieldstein; Structural Engineers: Robert E. McLaughlin; Mechanical Engineer: Leslie S. Tarleton. Contractors: Ambrose-Augusterfer Corp.



Three Type O **p-k** single pass Hot Water Converters are in use at the new, modern Rittenhouse-Claridge. Each heats 785-gpm of water from 160°F to 180°F with steam at 25# psig pressure.



Three 60" x 168" Type B **p-k** Storage Heaters are used. Each has a live steam section to heat 3600 gph from 40°F to 180°F with steam at 5 psig and a condensate cooling element with 75 sq. ft. of surface.

the **Patterson-Kelley Co.,** *Inc.*

1320 Burson St., East Stroudsburg, Penna.

leaders in heat transfer equipment since 1880

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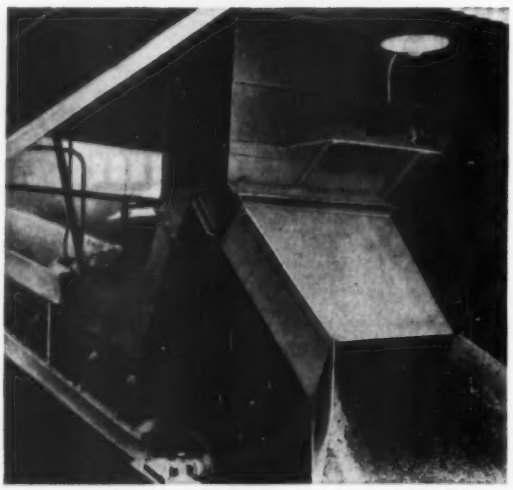
For more facts circle 606 on Reply Card

PITTSBURGH COKE & CHEMICAL Reports:

ERIEZ DRUM PULLS IRON FROM SLAG AND IT'S WORTH $40 A TON TO US!

ERIEZ Permanent Magnetic Drum removes 3 tons of iron daily!

"It's like finding gold . . ." says L. R. Forbrich, Cement Plant Superintendent of the Pittsburgh Coke & Chemical Company. Installed on a granulated slag drier, an Eriez Permanent Magnetic Drum has been working 24 hours a day . . . separating an average of 3 tons of scrap metal profits each week from granulated slag! The slag is used in the manufacture of the company's Green Bag Portland-Pozzolan Cement. "The Eriez Drum not only maintains our product's quality, but it reclaims valuable metal. This metal, as scrap iron, is worth about $40 a ton to us on today's market. The drum has paid for itself many times over."



Installed at the discharge of an open or closed chute, spout or screw conveyor, etc., the Eriez Magnetic Drum and Housing automatically, simply and economically removes tramp iron from chemicals.

Only the ERIEZ line of Drums has All These Features:

1. Stainless steel shell resists corrosion and abrasion.
2. Dust-tight construction standard at no extra cost.
3. Rigid, lightweight, compact, cast aluminum sides.
4. Sheave size easily changed for various operating speeds.

Write for new, FREE 6-page Drum Bulletin which describes all separator installations for the chemical industry.

ERIEZ MANUFACTURING COMPANY

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"Buy permanent protection . . . by ERIEZ"

For more facts circle 607 on Reply Card

NEW PRODUCTS

(Begins on page 148)

and quicker to operate when large faults occur.

When an arc breaks down transformer oil, the increased gas pressure is transmitted from transformer case to relay device through a small tube. The pressure differential is "throttled" through the tube and actuates a bellows that is sensitive to a rate of pressure as low as approximately 1 oz per sq in. per second. A microswitch connected to the bellows will sound an alarm or trip a breaker to take the transformer out of service. A manually-operated momentary "off" switch is provided to reset the relay.

Faults that produce rates of rise of pressure of 10 to 15 psi per second c use the relay to operate in two or three cycles, it is noted, and rates of 40 psi per second cause operation within ½ cycle. (For further information circle No. 32 on Reader Service Card.) Westinghouse Electric Corp.

33—DYE PENETRANT finds flaws in solid materials

Spotchek is described as a reliable, non-toxic dye penetrant for testing metals, ceramics, plastics and other non-porous materials to locate cracks and leaks. Applications include maintenance of mechanical equipment, inspection of tools, inspection of castings, forgings and welds, and overhaul testing of transportation equipment.

As the name implies, Spotchek is best used for local areas of large parts, or in remote locations where only a few parts are to be tested. In use, the penetrant is sprayed on the clean surface to be tested. Then the cleaner is sprayed on quickly wiped off. A coat of white developer is brushed on and inspection is possible in a few seconds,

company states, cracks showing up as red lines and leaks as red spots.

Materials used for the testing come in a kit containing penetrant (in both spray and screw-type cans) cleaner, developer, wiping cloths and brush and instruction book, all packed in a handy carrying case. (For illustrated bulletin circle No. 33 on Reader Service Card.) Magnaflux Corp.

34—STACKING ACCESSORY for use on fork lift trucks

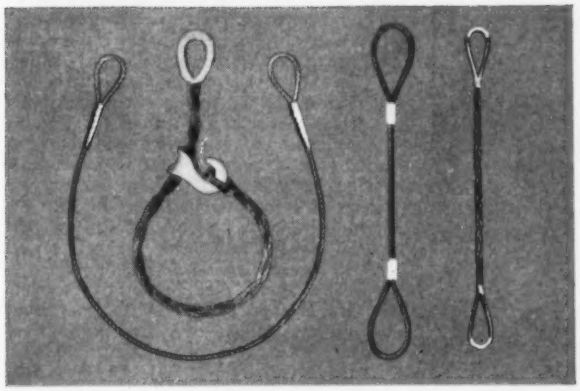
Stacking inside a freight car, truck can, under balconies or other low overhead clearance spots can be done with a power lift truck equipped with the Hi Duty Freelift. It is designed to fit all fork lift trucks in manufacturer's Hi

PREFORMED INTERNALLY LUBRICATED

Wire Rope

for cranes, hoists, elevators, and all equipment

From Macwhyte's complete line of a thousand and one sizes and types, you get the right rope for your equipment. Thoroughly lubricated, PREformed, engineered to give long, low-cost service. *Send for Catalog G-15.*

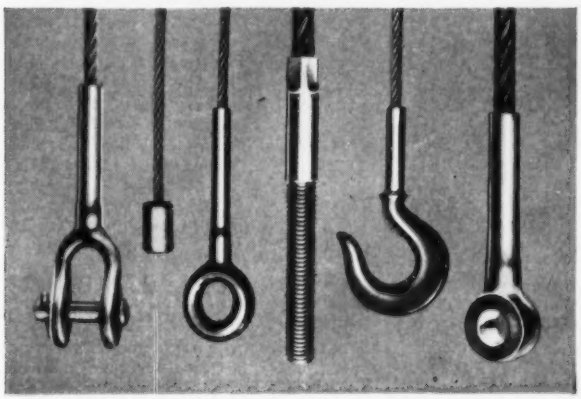


WIRE ROPE

Slings

for lifting and moving materials, equipment in production or maintenance

There are hundreds of types and sizes of Macwhyte Round-Braided, Flat-Braided, Single-Part, and Grommet Slings. All are custom made in length, capacity, and flexibility to meet your needs. *Send for Catalog S-8.*



WIRE ROPE

Assemblies

for machine parts, controls, and operating devices

Macwhyte Safe-Lock wire rope assemblies are made to order in length, strength, and flexibility desired. Terminals are permanently attached to one or both ends. There are many standard types. *Send for Catalog 5201.*

MACWHYTE

1028-SW

These catalogs available on request

MACWHYTE COMPANY

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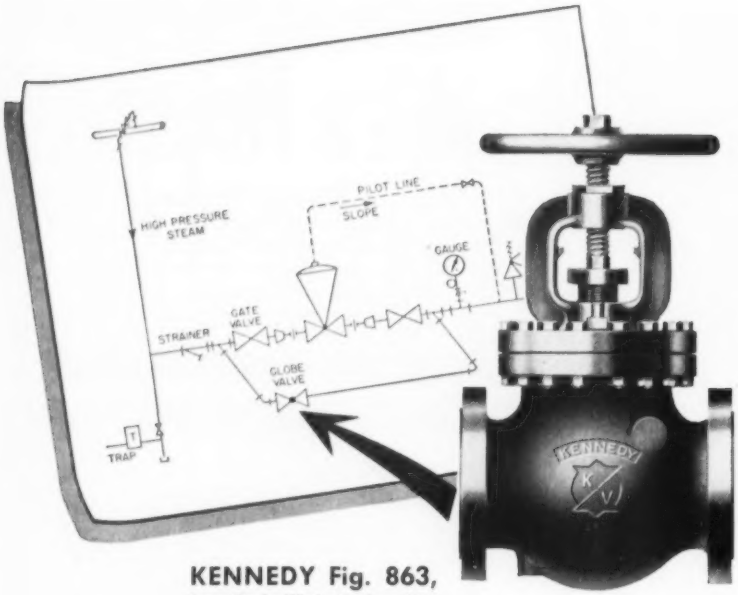


KENNEDY Fig. 863,
Iron-Body Globe Valve. 250 pounds of steam at 500°F.

Here's how to set up pressure-reducing lines for easier maintenance

You naturally don't want to shut down a vital part of your operation when you repair a single valve.

You can avoid doing so by installing a by-pass around your pressure-reducing valve and installing a globe valve in the by-pass line. With this set-up you can use the globe valve for hand throttling when the reducing valve is removed from the line for repairs.

KENNEDY JOB-FITTED IRON-BODY GLOBE VALVES are designed and constructed for high pressures and severe service on steam or water lines and for heavy-duty service with oil, gas and other fluids that do not corrode bronze or iron.

Individual valves in the KENNEDY JOB-FITTED line are specially designed with the proper disc and seat trim to match the service for which they are recommended. Valves with either renewable composition or bronze faced discs are available, depending on the pressure in the line.

REPACK UNDER PRESSURE—You can repack ALL KENNEDY iron-body globe valves under full line pressure when wide open.

THE COMPLETE LINE of KENNEDY JOB-FITTED valves and INSPECTED fittings is sold through local distributors who are in a position to give you fast and convenient service.

THE **KENNEDY**
VALVE MFG. CO. • ELMIRA, N.Y.
Est. 1877
VALVES • PIPE FITTINGS • FIRE HYDRANTS

For more facts circle 609 on Reply Card

NEW PRODUCTS

(Begins on page 148)

Duty line and is available as added equipment.

This accessory differs from most units of this type by being entirely hydraulic. When used on a fork lift with standard 9-ft mast (collapsed height of 6½ ft) the load on the forks can be lifted as high as 5 ft 4 in. before the mast begins to move upward. (For complete details circle No. 34 on Reader Service Card.) Transitier Truck Co.

35—MAGNETIC DRUM for the removal of tramp iron

Improvements designed to increase efficiency are announced for this manufacturer's permanent magnetic drums. These drums remove tramp iron and medium fine ferrous contamination from materials conveyed in spouts, chutes and other conveying systems not employing belts. Among improvements incorporated are changeable sheave sizes for various operating speeds; adjustable feeder assemblies; light-weight rigid, cast aluminum sides; oil sealed bearings; extended discharge ducts.

The drum, available in two models (DE-101 and DF-102) with or without housing, is a revolving cylindrical shell within which a stationary Alnico V permanent magnet is located. Material is fed into the drum hopper, where flow is regulated, and as it reaches the drum the unit's magnetic field attracts ferrous particles to the revolving shell. The shell carries the material through the stationary magnetic field. Non-magnetic material falls free, while ferrous particles are held until carried beyond the magnetic field. (For Bulletin B-601, describing magnetic drums and their applications, circle No. 35 on Reader Service Card.) Eriez Mfg. Co.

36—MINIATURE INDICATORS for panelboard mountings

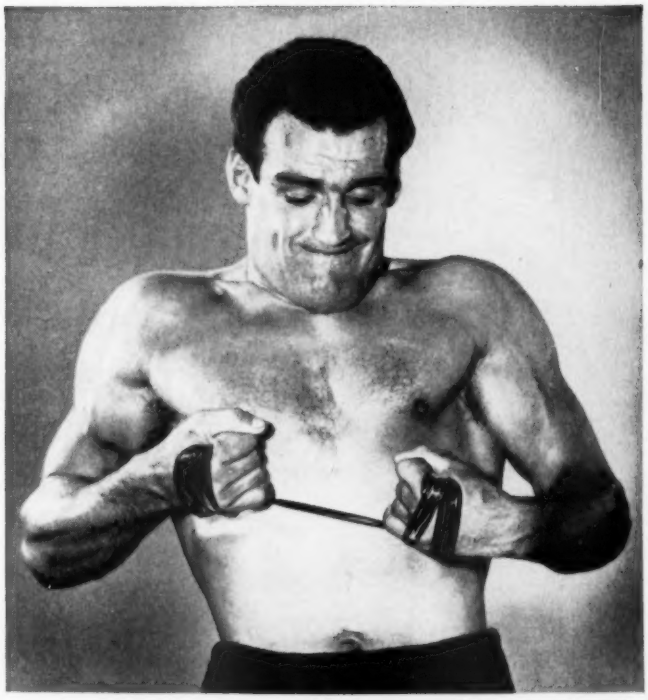
Mindicators are vertical scale indicating instruments. Designed for panel mounting, these multiple purpose gages are used on graphic or process control panel boards as receivers and as direct reading gages and thermometers. Mindicators offer interchangeability of parts and complete assemblies, and their cost of installation and maintenance is said to be very low.

Of their many features, accuracy, legibility and compactness are declared most important. All instruments have a legible 4-in. scale, yet require a panel opening of only 5-⅜ by 1½ in. for single units and 1-⅜ in. additional width for each unit added to a multiple housing.

Mindicator housings are complete units permanently installed on the equipment or panel board from the rear, but each measuring unit is a complete and independent instrument. Mindicators designed as receivers operate on transmitted pressure of 3 to 15 psig, using individually calibrated me-

World's strongest tape?

Even the world's strongest wrestler can't break it! This unbelievably tough "Scotch" Brand Filament Tape proves itself on scores of "impossible" heavy-duty jobs.



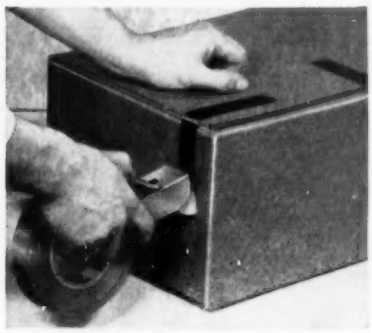
Paul Baillergeon, world's strongest wrestler

REINFORCING these 57 lb. cartons is a cinch with "Scotch" Brand Filament Tape No. 880. Unlike conventional banding materials, tape doesn't cut into cartons or make loading difficult.

SECURING free end of huge sheet metal rolls is another job done faster, easier with "Scotch" Brand Filament Tape No. 880. Despite rough handling, only one strip of tape is needed.

BUNDLING veneer door rails, moldings, millwork and siding *safely* with "Scotch" Brand Filament Tape No. 880. Tape prevents slipping and sliding of pieces in bundles. Easy disposal, too!

BANDING and identifying tubing, conduit, and steel rod stock with "Scotch" Brand Filament Tape No. 880. Automatic banding equipment is available. Tape comes in red, white, black and transparent for color coding.



HANDY DISPENSER offers quick method of applying "Scotch" Brand Filament Tapes. For more information, plus a sample roll of tape for testing purposes, write Minnesota Mining & Mfg. Co., Dept. PE-33, St. Paul, Minn.

REG U S PAT OFF

SCOTCH

BRAND

FILAMENT TAPE

NO. 880

Made in U. S. A by

MINNESOTA MINING & MFG. CO.

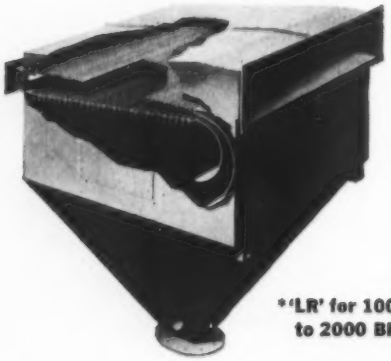
St. Paul 6, Minnesota

3M COMPANY

The term "Scotch" and the plaid design are registered trademarks for the more than 200 pressure-sensitive tapes made by the makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N. Y. In Canada: London, Ont., Can.

For more facts circle 610 on Reply Card

It's no longer a problem to collect dust from boilers with BHP as low as 100 to 2000! With the Buell 'LR' Dust Collector, you can more than meet local dust abatement demands. This highly efficient unit gets 99% of all 100-mesh (and larger) cinder discharge. Furthermore, draft loss with the 'LR' is so low, you can even use it on the smallest natural draft boilers.



*'LR' for 100 to 2000 BHP

For full information on how the Buell 'LR' Dust Collector can help you solve your Fly Ash problem, write today for the latest bulletin on 'LR'. Buell Engineering Company, Dept. 14-C, 70 Pine Street, New York 5, N. Y.

REG. U. S. PAT. OFF.

buell

Engineered Efficiency in **Fly Ash Collection**

For more facts circle 611 on Reply Card

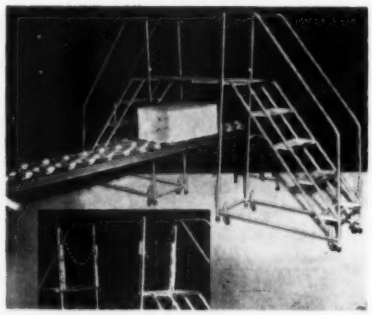
NEW PRODUCTS

(Begins on page 148)

tallic bellows measuring elements. Direct reading thermometers are available in scale ranges from –200 F to 1000 F. Direct-reading pressure gages come in many scale arrangements from 0 to 10 psig to 0 to 1000 psig. (For bulletin circle No. 36 on Reader Service Card.) The Dickson Co.

37—CONVEYOR WALK-OVER provided by steel ladders

Passage blocks and inaccessabilities of areas above conveyor systems may be eliminated by the use of two Safety Step Ladders equipped with a connecting walkway. The walkway can be folded up so the ladders can be used



separately when not needed to cross over conveyors. Standard size ladders are available for almost any required height. They're built of steel in two types—one with rubber tipped legs for permanent or semi-permanent installation, and the other with casters for easy movement. These casters retract when a person steps on the ladder, so that the rubber tipped legs engage the floor. (For data, prices circle No. 37 on Reader Service Card.) Ballymore Co.

38—MULTI-PURPOSE TILE is tough and good looking

Kenflex, a new vinyl asbestos tile, is described as greaseproof, alkali-proof, fire resistant and resistant to acids, cooking fats, oils and gasoline. And it comes in 14 beautiful colors which won't fade or wear off, company points out, because they go all the way through each tile.

The tiles come in standard 9 by 9 in. size and in two thicknesses—standard and ⅛ in. Since Kenflex can be installed on concrete in direct contact with the earth, it can be used in below grade installations. Company says it is strong and flexible and its toughness enables it to resist indentations. (Circle No. 38 on Reader Service Card for information.) Kentile, Inc.

39—PULL BOXES come in two types, several sizes

These new pull boxes include the Type A, a hinged cover surface cutout box for electrical cutouts, signal, telephone, junction and pull box applications. It has a flush ring and friction

FOR 90° THREADED CONNECTIONS IN ALL HIGH AND LOW PRESSURE PIPING SYSTEMS . . .

specify and use

BONNEY THREDOLETS

YOU DERIVE THE FOLLOWING ADVANTAGES:

1. ACCELERATED FABRICATION—

with ThredOlets no coupling preparation is necessary—you obtain the most economical type of construction.

2. NEAT AND UNIFORM APPEARANCE—

ThredOlets minimize variations caused by human element—you attain the best engineered type of construction.

3. IMPROVED FLOW—

ThredOlets provide a funnelled inlet—you achieve better performance and better piping system design.

4. DIMENSIONAL STANDARDIZATION—

with each ThredOlet installation, you have constant control of the critical center-of-run-pipe to face-of-outlet dimension.

The Bonney WeldOlet Welding Fittings Catalog, No. W-3, provides complete engineering and dimensional data.
Write for your free copy.

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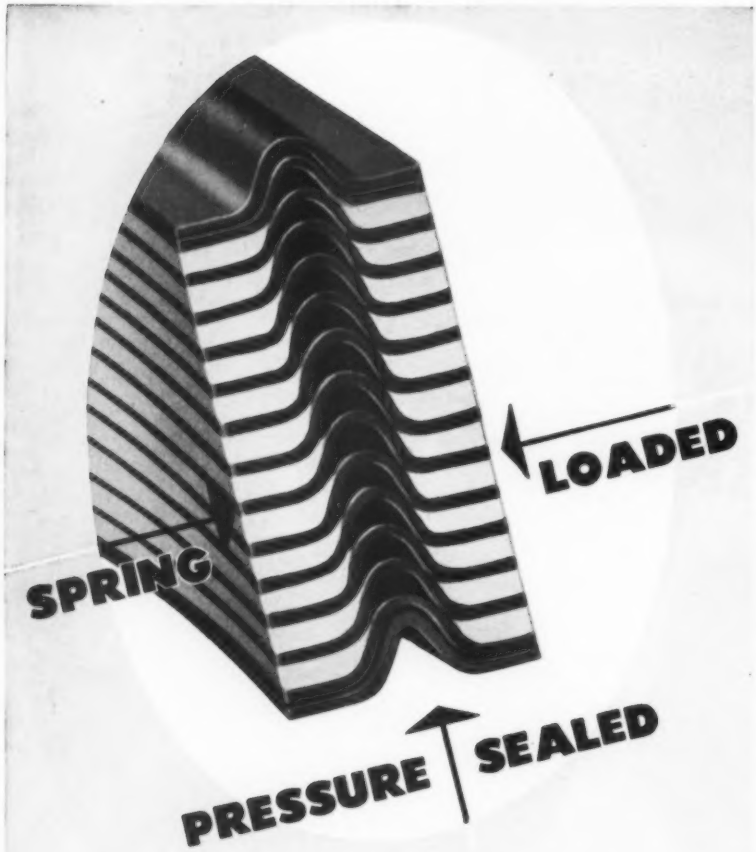

It's the live-spring action and U-shape of the metal plies in Ajax Spiralwound Gaskets that permits them to give and take with varying pipe line or boiler stresses, to seal joints tight at safe bolt loads and utilize the pressures they are sealing against to keep them tight under all operating conditions.

There are types and sizes for all standard flanges and for manholes, handholes and tube caps for all makes of stationary and marine boilers, waterwalls, economizers, etc.

Materials of construction include plated low carbon steel or stainless, Canadian or blue African asbestos or chemically inert duPont Teflon.

Sold universally through industrial distributors. Ask your supply house or write—

UNITED STATES GASKET COMPANY

FABRICATORS OF "TEFLON" & "KEL-F" FOR THE CHEMICAL PROCESS & ELECTRONIC INDUSTRIES

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Representatives in Principal Cities Throughout the World

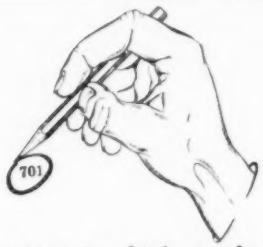
For more facts circle 613 on Reply Card

NEW PRODUCTS

(Begins on page 148)

catch, and the hinged cover telescopes over the sides to make the box substantially dustproof. Stock sizes range from 4½ by 5 by 3 in. to 24 by 18 by 6 in. The Type SC is a screw cover box, especially suitable for junction and pull box use. Stock sizes range from 6 by 6 by 4 in. to 18 by 12 by 6 in.

Both types are welded sheet steel and available either with or without standard concentric knockouts. Special knockouts for individual requirements can be furnished at slightly higher cost. Standard finish is hard gray enamel. (For price information and catalog circle No. 39 on Reader Service Card.) Keystone Mfg. Co.



It's easy to obtain product data with the postage-free Reader Service Cards on pages 35-36 and 197-198. Use them for information and advertised products, too. Just circle the key number appearing at bottom of the ad.

40—INSULATING BLOCKS for high temperature use

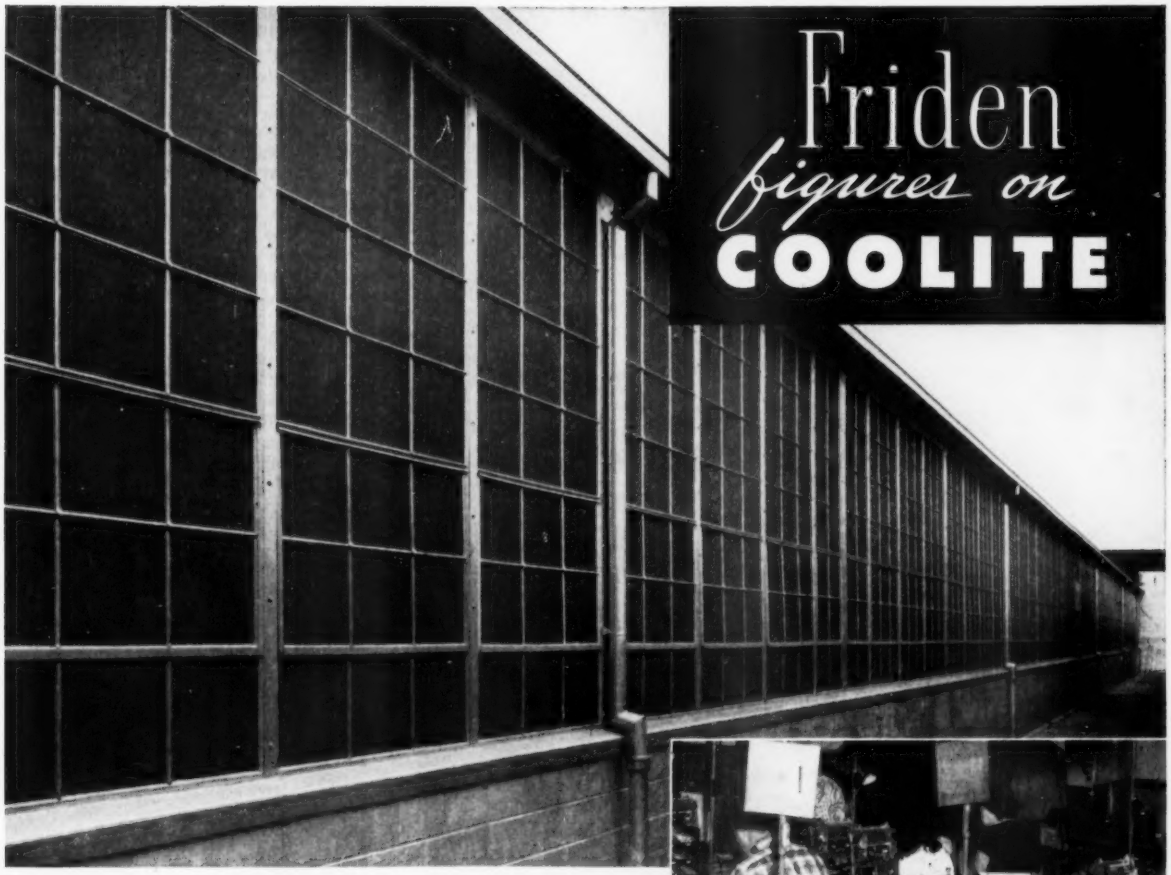
Supertemp "P. V." (Pressure Vacuum) Insulating Blocks are declared suited for temperatures up to 1900 F, and are reported to be a great improvement over many mineral wool insulating blocks. According to manufacturer, they withstand higher temperatures, have greater breaking strength and afford greater utility because of their ease in handling and light weight.

In the manufacture of these blocks, special equipment puts to use a combination of vacuum and pressure techniques which cause the mineral fibers within the block to become felted and compressed. (Circle No. 40 on Reader Service Card for details.) The Eagle-Picher Co.

41—AIR VALVE designed to prevent press "repeats"

An air control valve is announced which, according to manufacturer, makes practically impossible "repeats" due to valve failure on mechanical presses controlled by air-operated clutches and brakes. Latest of company's Pilot Master Valves, the new valve is the PM Series BB-5. It is a

Friden *figures on* COOLITE



Exterior of new Friden Calculator plant, San Leandro, Calif., showing the extensive use of Coolite to provide ample daylight illumination. Architect, Frederick H. Reimers, San Francisco, Calif.

Calculator Manufacturer's New Plant Glazed with 8200 Sq. Ft. of Coolite Glass by Mississippi

Careful assembly operations build into each Friden Calculator the accuracy for which these machines are famous. To help achieve the best possible working conditions, Coolite Heat Absorbing and Glare Reducing Glass was specified in Friden's new plant at San Leandro, California.

Coolite filters out unwanted factors in raw sunlight and helps keep plant interiors cooler and more comfortable. Workers see better, feel better, work better under softly tinted, filtered daylight. Coolite helps fight eye fatigue, boosts employee morale.

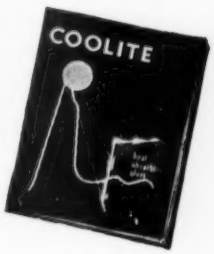
SEE HOW YOU CAN PROFIT WITH COOLITE

This amazing "visioneered" glass by Mississippi helps production, reduces rejects. If you are planning new industrial construction or modernizing existing facilities, it will pay you to find out how Coolite can provide increased efficiency and economy. See your nearby Mississippi Glass distributor today.

Assembly workers find daylight, diffused and tinted by Coolite is more comfortable. Copious illumination eliminates shadows, helps make seeing more accurate.

Translucent, light diffusing figured and wired glass by Mississippi for better daylight illumination is available in a wide variety of patterns and surface finishes, all scientifically designed to distribute light to best advantage.

Send for free Coolite catalog, "Coolite Heat Absorbing and Glare Reducing Glass." Samples on request.



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NEW YORK • CHICAGO • FULLERTON, CALIF.

WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

For more facts circle 614 on Reply Card

in the new Raybestos-Manhattan Plant

The cleanliness that is possible in plants having heavy dust-creating operations is illustrated in the new Raybestos-Manhattan plant in Crawfordsville, Indiana. The fine metallic powders used in making clutch plates and related products provide a potential dust condition that is stopped before it starts by a highly efficient dust control system.

A series of Dustube Collectors are used with adequate hooding at each dust point. One of the units ventilates batching and screening operations, and weighing, loading and unloading of the material at the pug mill. Each of the two hydraulic molding presses has several hooks located around the platen to trap dust created by the filling of the mold cavity and pressing operations. This dust is whisked away to other Dustube Collectors and the collected material is salvaged for reusage.

SEND FOR DUSTUBE CATALOG 372 TODAY

American dustube COLLECTORS

WHEELABRATOR & EQUIPMENT CORP.

839 S. Byrkit St., Mishawaka, Ind.

For more facts circle 615 on Reply Card

NEW PRODUCTS

(Begins on page 148)

dual three-way valve, two three-way valves in parallel in one compact body. Both valves must operate to start the press, it is explained, but if for any reason only one valve reverses, the unit "fails safe" and the press stops.

The new valve is offered in ¾ in. IPS, and is said to be capable of speeds in excess of 600 cycles per minute. The two solenoids in this valve are connected in parallel in the electric circuit of the press. The two pilot sections are interlocked pneumatically so that, if either solenoid fails to operate, the valve will not build up enough pilot pressure to operate either main valve and the press will not start. On the other hand, with the press moving, if either solenoid or either pilot valve reverses, pilot pressure will fall so low on both sides that both main valves will reverse and the press will stop. (For full details circle No. 41 on Reader Service Card.) Hannifin Corp.

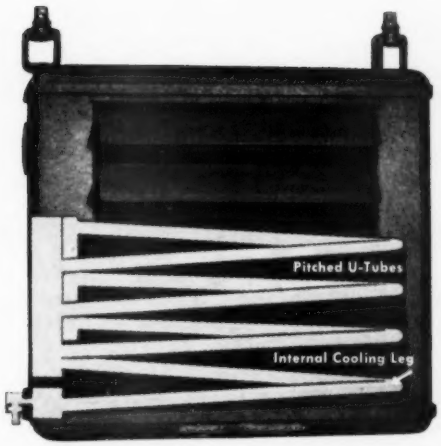
42—FLOW METERS for fluid flow in small quantities

This new SK Purge Rotameter is designed for use where small, low-cost flow meters are needed to indicate and manually control small flows of fluids with good reproducibility but moderate measuring accuracy. Typical applications include the indication of flow of supply air in bubbler type liquid level measuring installations, and flow of purge fluid, generally water or air, in the pipelines connecting orifices, venturi tubes or nozzles to differential head flow meters.

These are small size variable area type flow meters for low flow ranges. Rate of flow is indicated by the position of a ball float moving in the tapered glass meter tube in the meter. Rate of flow is read in reference to the center of the ball float on a scale mounted alongside the meter tube. A back flow check valve is provided. SK Purge Rotameters can be installed in pipelines, on instrument panels or in instrument cases; they must be installed in a vertical position. (For full details circle No. 42 on Reader Service Card.) Schutte and Koerting Co.

43—DRY CONCRETE BASE is for flooring installations

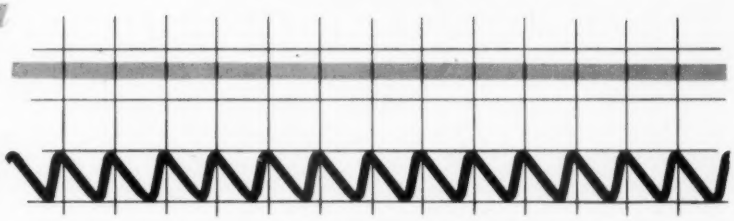
A recent series of tests on integral water-resisting admixes for concrete is reported to show that Hydropel, an aqueous suspension of colloidal asphalt developed for use in cement concrete and mortars, was the most effective of



when buying unit heaters

be sure you get this

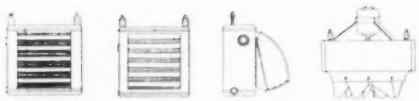
...not this!



With **THERMOLIER**...

the Grinnell Unit Heater . . . you get

CONTINUOUS RATED CAPACITY



Horizontal Delivery | Textile Model | Velocity Nozzle | Vertical Delivery

THERMOLIER FEATURES

INTERNAL COOLING LEG A Grinnell feature which permits the use of a plain thermostatic trap for draining condensate.

PITCHED U-TUBES Built-in pitch of U-tubes provides complete drainage of condensate and elimination of destructive water hammer.

CONTINUOUS RATED CAPACITY The combination of Thermolier's internal cooling leg and the built-in pitch of tubes assures continuous rated capacity.

BUILT-IN EXPANSION PROVISIONS Every tube is an expansion bend of the U type to allow for independent expansion and contraction of each tube.

TUBE-TO-HEADER CONSTRUCTION Safety and durability assured by unique tube-to-header construction.

EASE OF ERECTION Exclusive with Thermolier are the adjustable swivel couplings which provide an easy, cost-saving method of hanging the unit.

SIMPLE PIPE CONNECTIONS The supply and return piping connections are on the same side to assure compactness, neatness and economy in installation.

MOTORS Thermolier motors are built specifically for unit heater duty. They give maximum operating efficiency with minimum power cost.

The practical advantages of unit heating, of course, are well known. But in order to get *maximum* economy and efficiency, certain engineering and structural features *must be* present in the unit heater of your choice.

Take provisions for draining off condensate. Failure to provide freedom from collected condensate in the heating element can interfere with heat output and adversely affect capacity.

A Thermolier Unit Heater successfully handles this drainage problem with its pitched U-tubes and internal cooling leg, through which all the condensate passes. In fact, condensate cooling is so efficient with Grinnell Thermoliers that a thermostatic trap — the simplest and least expensive of all traps — can be used with every model. Condensate temperature is lowered to the point where the trap is always draining — giving Thermolier Unit Heaters their *continuous rated capacity.*

Check Thermolier's advantages at left. For more details, call your local Grinnell distributor — or send for catalog.

GRINNELL

THERMOLIER UNIT HEATERS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

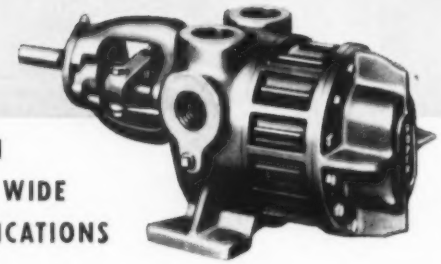
Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

For more facts circle 616 on Reply Card

Install

ROPER ROTARY PUMPS

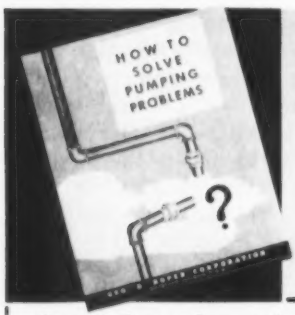
for Positive Results



MODELS FOR AN EXCEPTIONALLY WIDE RANGE OF APPLICATIONS

SERIES F PUMP

SERIES	TYPICAL USES	PRESSURES	SIZES
3600	All Petroleum Handling Grease Compounding Oil Circulating General Transfer	to 60 P.S.I.	40-300 G.P.M.
F	Pressure Lubrication Hydraulic Power Fuel Transfer Lube Oil Transfer	to 300 P.S.I.	1-300 G.P.M.
K	Pressure Lubrication Hydraulic Service Industrial Oil Burner Fuel Supply	to 150 P.S.I.	¾-50 G.P.M.
H	Hydraulic Power Test Equipment Pressure Lubrication High Pressure Coolant	to 1000 P.S.I.	5-75 G.P.M.



NEW! LATEST EDITION OF THIS BOOKLET NOW READY FOR YOU! SEND FOR YOUR FREE COPY

A valuable guide covering important fundamentals of estimating requirements of the average pumping job. It includes tables, charts, sample problems, and other pertinent data. SEND COUPON BELOW.

Geo. D. Roper Corporation, 143 Blackhawk Park Ave., Rockford, Ill.

Please Send Booklet—"How to Solve Pumping Problems"

NAME .....

ADDRESS .....

CITY ..... STATE .....

ROPER Rotary Pumps

For more facts circle 617 on Reply Card

NEW PRODUCTS

(Begins on page 148)

those tested. The tests covered resistance to moisture-absorption, compression, abrasion and salt soundness. Chief feature announced for Hydropel is superior moisture-absorption resistance without loss of strength or resistance to abrasion. (For further information on Hydropel circle No. 43 on Reader Service Card.) American Bitumuls & Asphalt Co.

44—VARIABLE SPEED MOTORS have double-ribbed V-belt

A newly announced improvement in this company's variable speed motors concerns the perfection of a double-ribbed V-belt designed to reduce internal friction and permit greater flexibility. By means of this belt, replacing the single-ribbed belt, greater speeds and smaller diameters can be combined, it is explained, and this, in turn, has permitted further design changes to develop greater horsepower within a smaller space. The result is maximum motor compactness, it is noted.

In the new belt design the outer periphery is relieved of tensile strains, company explains, and the inner periphery is free from excess compression, allowing the belt to bend easily. The belts are made of a durable synthetic rubber compound built up in layers and cured under pressure in precision molds. The use of the synthetic fiber instead of cotton cords is said to add more strength and permit use of smaller cords to reduce heat. (For bulletin circle No. 44 on Reader Service Card.) U. S. Electrical Motors Inc.

45—HIGH FREQUENCY AMPLIFIER for voltage testing

A new way to test secondary voltage of synchros and other circuits requiring meter current corrections is provided by the Model 105 Meter Matcher, described as a highly accurate power frequency amplifier. When used in conjunction with a voltmeter or wattmeter it practically eliminates errors previously caused by meter currents, manufacturer states.

In a typical application, the secondary voltage of synchros under test varies from 40 to 90 v. A ¼ per cent accuracy electrodynamometer voltmeter with resistance of 3000 ohms is used. To prevent loading the synchro, at least 100,000 ohms must be across the secondary—hence the Meter Matcher. Its input is connected to the synchro, its output to the voltmeter. Input impedance of the Meter Matcher requires less than 150 microamperes from the test circuit. Its output provides the 0.05 to 0.07 amp which many dynamometer instruments require for full-scale deflection.

Connections for 15, 75, 150, 300 and 600 v inputs are provided, with an output of 150 v in each case. This gives a 150-v voltmeter or wattmeter an effec-

BOILER CLEANED CLEANER BY DOWELL SERVICE

Chemical solvents removed 1650 lb. of deposits from boiler previously "cleaned" by turbining

When you consider that liquid chemical solvents will reach wherever water will flow, you can soon appreciate the many advantages of cleaning with chemistry.

Where mechanical devices, rattling, and turbining fail to clean—in crevices, around angles, through openings—Dowell solvents are designed to dissolve and loosen scale and sludge . . . carry away these profit-stealing deposits quickly and easily.

For example, Dowell recently cleaned a 150,000 pphr boiler that had previously been turbine-cleaned. Although the chemical cleaning required only a few hours, Dowell engineers removed 1,650 *additional* pounds of deposits from the boiler. Best of all, no scaffolding or dismantling of equipment was necessary. Dowell-designed equipment was used to introduce special liquid solvents through regular connections. Downtime was kept to a minimum.

What is *your* cleaning problem? Dowell has extensive experience in cleaning all kinds of process and heat exchange equipment. Dowell furnishes trained personnel, pump trucks, and control equipment.

Dowell engineers apply liquid solvents according to the technique demanded by the job: for example, by filling, spraying, jetting, cascading or vaporizing.

For further details or estimates, call your nearest Dowell office or station. Or write to Tulsa, Dept. C-27.

DOWELL SERVICE

Over 100 Offices to Serve You with Chemical Cleaning for:

Boilers • Condensers • Heat Exchangers • Cooling Systems
Pipe Lines • Piping Systems • Gas Washers • Process Towers
Process Equipment • Evaporators • Filter Beds • Tanks

Chemical Services for Oil, Gas and Water Wells

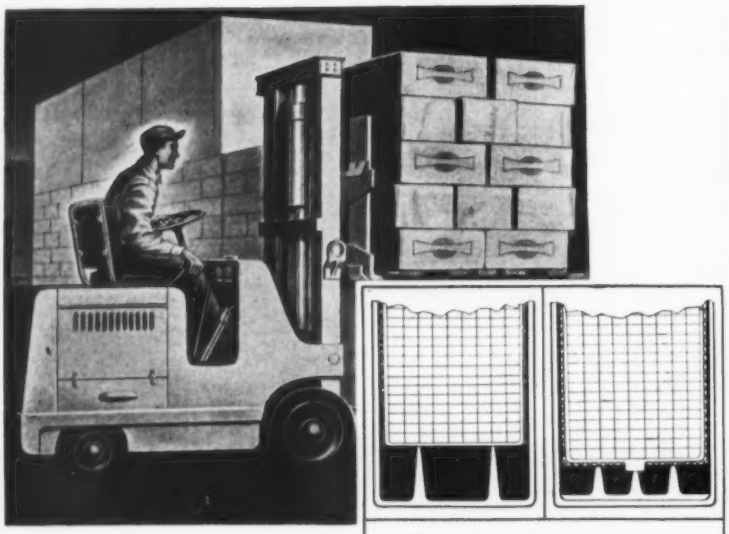
DOWELL INCORPORATED • TULSA 1, OKLAHOMA

DOWELL

A Service Subsidiary of
THE DOW CHEMICAL COMPANY

For more facts circle 618 on Reply Card

With C&D *Slyver-Clad** Batteries it's all work and no play



COMPARE THEM! At left: an ordinary battery with large, unproductive sediment space and integrally molded supporting ribs. At right: a C & D Slyver-Clad showing longer, power-producing plates. Separate rib plate in new double bottom design distributes battery weight evenly over jar base. Negative plates rest on separate center rib.

With C&D Five-Fold *Slyver-Clad* Batteries you get full shift operation with your Electric Trucks. Their added capacity provides ample power for a heavy duty cycle under all power consuming requirements. And the high capacity and sustained voltage characteristics provide maximum desirable truck speeds for the duty cycle.

This added capacity is made possible by C&D's Five-Fold *Slyver-Clad* method of insulation and retention. The active material is held in place on the positive grid, and sedimentation is virtually eliminated. Normal battery sediment space is reduced, permitting longer and heavier plates, giving from 10 to 30% more capacity in the same size tray.

As Five-Fold *Slyver-Clad* construction virtually eliminates "shedding", C&D Batteries maintain their capacity longer than conventional batteries, with a minimum of 80% of capacity at the fag end of a long life.

*Trade Mark Registered

C&D

BATTERIES, INC.

OF CONSHOHOCKEN, PA.

(In the Philadelphia Area)

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

For more facts circle 619 on Reply Card

NEW PRODUCTS

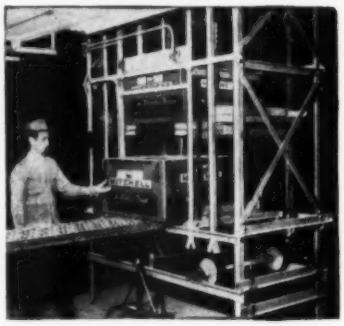
(Begins on page 148)

tive range of full-scale voltages from 15 to 600 v, it is noted. (For full details circle No. 45 on Reader Service Card.) Keithley Instruments.

46—INDUSTRIAL SUBVEYOR for handling, processing

Fast vertical handling of materials in trays, cartons and boxes is offered by these industrial-type subveyors. The packages are supported by flights on endless chains affording a continuous flow. Containers are held right side up. Automatic loading from horizontal feeding conveyors or automatic unloading onto horizontal conveyors at the discharge point can be provided.

In addition to package handling the subveyors offer advantages in processing operations, such as baking, cooling and drying, where materials must be kept separated for long periods in a limited area. The subveyors can be furnished for practically any height to



handle packages of almost any size at speeds up to 30 a minute. The air conditioners shown with the subveyor pictured weigh about 200 lb. They are being moved from the third floor to the shipping dock. (For literature circle No. 46 on Reader Service Card.) Samuel Olson Mfg. Co.

47—WELDER is 300-amp a-c unit for wide application

A redesigned 300-amp a-c welding transformer features stepless current selection from 40 to 375 amp. Intended for applications from light-duty low-current sheet metal work to heavier-duty high-current industrial jobs, the welder incorporates an enlarged scale and finely threaded screw adjustment to facilitate easy current selections. It accommodates electrodes from 3/32 to ¼ in. dia and has a switch which enables the operator to change quickly from high to low or low to high range.

Arc stabilizing capacitors contribute toward increased production by enabling operator to strike and maintain an arc without popouts, company says. Extra protection against high temperature coil failure is provided by silicone insulation. The welder has studs at base. (Circle No. 47 on Reader Service Card.) General Electric Co.

CONTROL PIPELINE MOTION this dependable, maintenance-free space-saving way

6" I.D. Flexon dual controlled flexing expansion joints on 300 psi steam lines and 3" I.D. dual Flexoniflex units on condensate return line.

with FLEXON EXPANSION JOINTS

Eliminate the dangers of pipeline motion easily and permanently by installing Flexon Expansion Joints. These units are compact and easily installed. They can not leak and require no packing or maintenance of any kind. Just install them and forget them.

Flexon Expansion Joints are offered in three types—Free Flexing in copper or stainless steel for pressures to 30 psi—Controlled Flexing in copper or stainless steel for pressures to 300 psi—High Pressure Flexoniflex units in stainless steel for pressures to 5500 psi. All stainless steel pressure carriers withstand temperatures to 800° F. (1600° F. with special alloys). Copper models pressure and temperature rated according to code. All models are suitable for handling radial, axial and/or lateral pipeline motion.

Write for the name of your nearest Flexon representative.

Complete specifications on expansion joints to meet your needs are given in the new Flexon Expansion Joint Bulletin. Write for your copy today or see Flexonics Expansion Joint Catalogs in Sweet's, Chemical Engineering Catalog and The Refinery Catalog.

Flexonics Corporation EXPANSION JOINT DIVISION
1340 S. THIRD AVENUE · MAYWOOD, ILLINOIS

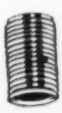
FORMERLY CHICAGO METAL HOSE CORPORATION
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Flexon identifies products of Flexonics Corporation that have served industry for over 50 years.

Flexible metal hose

Expansion joints

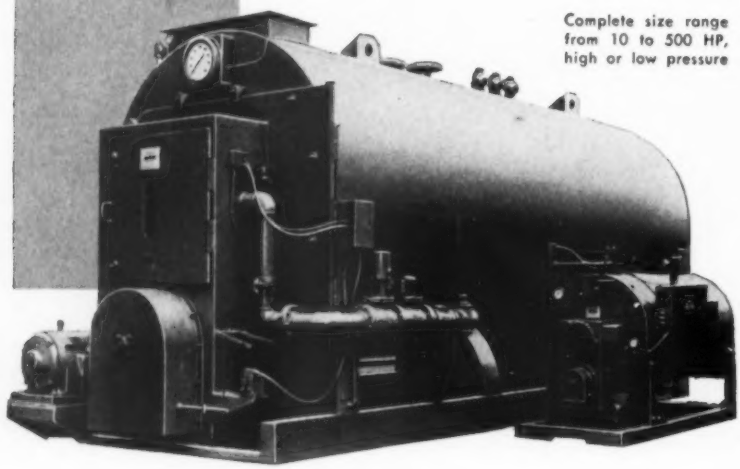
Aircraft components


Metallic bellows

For more facts circle 620 on Reply Card

3 you save three ways on steam with Continental AUTOMATIC BOILERS

. . . installation, fuel and maintenance!



Complete size range from 10 to 500 HP, high or low pressure

You save on the installation of Continental Automatic Boilers . . . Factory assembled and shop-fire tested, they are ready to operate after simple service connections in your plant. No special stack or foundation required.

You save on fuel with Continental Automatic Boilers . . . An exclusive firing method—U.S. and foreign patents pending—controls the mixture of fuel and air for uniform flame of high radiancy, giving a high heat transfer at a *guaranteed* efficiency of 80% plus! Built-in steam separator of special design assures steam 99% dry! Heat generated by the fuel—heavy or light oil, gas or a combination—is transferred *direct* to the boiler water, instead of being wasted in heating a refractory firebox.

You save on maintenance with Continental Automatic Boilers . . . No baffles or refractory to replace or repair. This means front and back covers can be opened to provide quick, easy access to furnace and tubes.

Continental Automatic Boilers are of rugged, built-to-last construction and improved precision design gained by 40 years of practical boiler building. Hundreds of these highly efficient boilers are setting records in economical, dependable and trouble-free service throughout the U.S. and Canada.

Why not find out how Continental can save you money on steam? Call or write today for full information.

BE BOILER ENGINEERING AND SUPPLY COMPANY, INC.
2 Manavon Street • Phoenixville, Pa.
40 Years of Boiler Experience

For more facts circle 621 on Reply Card

INDUSTRIAL FILMS

Machine Gas Cutting Film

A THREE REEL, color, sound motion picture, running time 29 minutes, covers in detail the application of machine gas cutting to modern industry. The film "Burning Blades" shows how this equipment can accurately cut intricate shapes in steel plate or slice through a 5 ft chunk of steel scrap.

The oxy-acetylene torch is shown at work in shipyards; in manufacturing plant cutting electronic parts, structural pieces and machinery components; and in steel mills reducing large pieces of scrap to the proper size for use in making steel.

Persons interested in more information on the availability of this film should contact Air Reduction, News Bureau, 60 East 42nd Street, New York 17, N. Y.

Driver Training and Safety

A 30-MINUTE sound film on driver training and safety for industrial truck operators has been released. Titled "Safety Saves," it was filmed at on-the-job factory and warehouse locations. It illustrates the do's and don'ts of safe driving and shows the cause of most truck accidents and how to avoid them.

The "villain" of the piece is Willie the Cowboy who drives his fork truck like a hot-rod. He is the kind of driver who doesn't look where he is going, ignores overhead clearance and parks his truck in the middle of busy aisles. The narrator of the film patiently tries to teach Willie the error of his ways, and nearly succeeds, but Willie makes one mistake too many.

Along with Willie's examples of how not to handle a fork truck, the film shows the correct, safe method. It also gives instructions for operators of towing tractors and hand trucks.

"Safety Saves" is available on a loan basis. For a reservation form, write to the Clark Equipment Co., Industrial Truck Division, Battle Creek, Mich.

Weather-Protected Motor

A COLOR SOUND FILM, "The Sky Is the Roof," featuring a newly developed weather-protected motor for outdoor service, is available for showing before engineering groups.

The motor is introduced with a brief history of its development. The storm tests to which it was subjected are then shown.

The film, which runs about 12 minutes, is available through the district offices of Allis-Chalmers Manufacturing Co. general machinery division.

Remington Rand Methods News

Three ways to untangle snarls in your production scheduling

Take the case of a plant where snarls developed about a year after it had been modernized. Suddenly orders backed up in the shop. Some machines had a big backlog while others were idle. Production control methods were out of mesh somewhere. But where? The production men were stymied when it came to overhauling the record-keeping methods.

Plant officials decided to call in Remington Rand for professional counsel. A preliminary study showed the problem went much further than machine-load scheduling. So our management engineers were authorized to dig deeper.

In their final report, these engineers proposed simple answers to each problem uncovered – all coordinated into a revised control system that soon eliminated snarls in machine loading. In fact, within three years this system was processing a doubled plant output with same smooth-working efficiency.

Let us give you the full case history of this plant's experience with *an outside viewpoint* to help simplify control methods. Ask for folder **CH-724.**

Or take the case of the big production snarl caused by a small part – because it is the wrong part. Poor description of parts causes all kinds of plant headaches: assembly delays, duplicate stocks, high paperwork costs.

But the remedy is simple and sure: identify and classify each item properly, so it can always be referred to by exact number. Recoding your parts and materials may cost less than you expect. Our engineers have built up a special library of standard nomenclature and numbering systems which can be readily adapted to your coding problems. For details, see **BSD-10.**

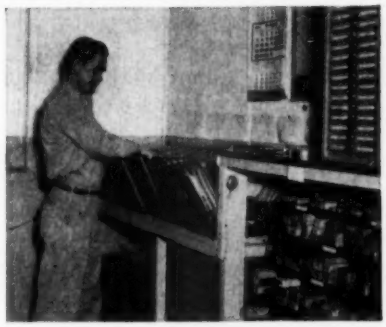
Another case is the production snarl caused by out-of-date control figures. When your clerks are not able to keep all records current, it's time for you to look into new ways of producing the figures. Many firms use our punched-card record services to get figures faster, at lower cost, for materials control, machine loading, costing, etc. See **BSD-6.**

GET A PRIVATE SHOWING OF NEW SOUND SLIDEFILM ON PRODUCTION CONTROL

It will be 23 minutes well spent for your key executives who get to see this brand new film on efficient coordination of men, machines and materials. Shows you practical methods for speeding a new schedule into actual production, holding down the materials inventory, spotting the bottlenecks before they happen, and adjusting a schedule to new conditions. Check coupon below for showing at your convenience.

RECORDS LOST. Here the loss of $40,000 in plant and equipment was covered by insurance. But the uninsured records of all orders in production were also destroyed. The firm paid heavily in both time and money to reconstruct these records. Such a fire always comes when least expected. The loss in records often exceeds the building losses. What would happen to *your* in-process papers?

RECORDS FOUND. Here, on the morning after a five-hour plant fire, all vital operating records were found intact. Though other files were completely destroyed, these papers survived in perfect condition. Remington Rand Safe-Files provided insulated protection *at the point of use!* This certified protection is also available in Safe-Desks and Safe-Cabinets. See actual case history RG-552.



Visible tool records cut production costs in this plant by accurate control of tool charge-outs and reordering points.

A new tool crib system won't cost you a penny!

A rush request comes in for a tool. If the tool is not there, work must be rescheduled. That's when you need tool-crib control that really works.

In plant after plant, a small investment for a 100% system has shown a big profit in: 1) assured availability of tools to meet production schedule needs; 2) numerous tangible savings on tool inventory, purchasing, repair, and losses; 3) reduced tool crib personnel.

Yes, it's actually easier, takes less work, to maintain *complete* control over tools than to rely on outmoded or makeshift routines. A Remington Rand tool crib system keeps paperwork at an absolute minimum . . . simplifies filing and finding of records by tool and by worker . . . gives your tool supply status in a *visible* picture by item.

It will pay you to study tool control forms and procedures now used in hundreds of plants, easily adaptable to your special plant needs. Ask for methods folder **KD-641.**

Remington Rand

Management Controls Reference Library
Room 1767, 315 Fourth Ave., New York 10

Please circle the literature you desire:

CH-724 BSD-10 BSD-6

☐ Production control film showing

RG-552 KD-641

Name_____

Title_____

Firm_____

Address_____

City_____

P-11

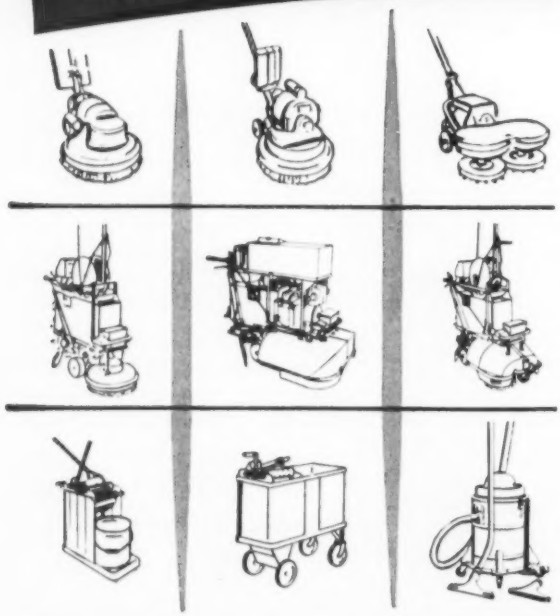
For more facts circle 622 on Reply Card

Keep your floor-maintenance men happy . . .

with *Job-Fitted* EQUIPMENT!

Choose from the COMPLETE *Finnell* Line

More than a score of models and sizes permits selection of the equipment that's exactly right for your job!



However much a maintenance man may want to do a good job, and at the same time show savings in labor costs, he's *stymied* if the machine is too small, or too large, or is otherwise unsuited to the job. Different floors and areas call for different care and equipment. That's why *Finnell makes more than a score of floor-maintenance machines.* From this complete line, it is possible to choose equipment that is correct in size as well as model . . . that provides the maximum brush coverage consistent with the area and arrangement of the floors.

Finnell makes *Conventional Polishing-Scrubbing Machines* in both concentrated and divided-weight types, each in a full range of sizes . . . a *Dry-Scrubber*, with self-sharpening brushes, for cleaning grease-caked floors . . . *Combination Scrubber-Vac Machines* for small, vast, and intermediate operations, including gasoline as well as electric models . . . *Mop Trucks* . . . *Vacuum Cleaners* for wet and dry pick-up, including a model with By-Pass Motor. In addition, *Finnell* makes a full line of fast-acting *Cleansers* for machine-scrubbing . . . *Sealers* and *Waxes* of every requisite type . . . *Steel-Wool Pads*, and other accessories — *everything for floor care!*

In keeping with the *Finnell* policy of rendering an individualized service, *Finnell maintains a nation-wide staff of floor specialists and engineers. There's a Finnell man near you* to help solve your particular floor-maintenance problems . . . to train your operators in the proper use of *Finnell Job-Fitted Equipment and Supplies* . . . and to make periodic check-ups. For consultation, demonstration, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 5303 East St., Elkhart, Ind. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

50th Anniversary — Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

For more facts circle 623 on Reply Card

NEW BOOKS

for the plant engineer

Gas Piping

GAS TRANSMISSION AND DISTRIBUTION PIPING SYSTEMS. (ASA B31.1.8-1952) (Section 8 of American Standard Code for Pressure Piping); illustrated; 36 pages; size 8 by 11 in.; paper bound; published by The American Society of Mechanical Engineers, 29 West 39th Street, New York 18, N. Y. Price $1.25.

This code for pressure piping is one of a series of safety codes on various subjects which have been, or are being, formulated under the general auspices of the American Standards Association, and represents a standard of minimum safety requirements for: (1) the selection of suitable materials and reference to standard specifications by which they may be secured; (2) the designation of proper dimensional standards for the elements comprising piping systems; (3) the design of the component parts as well as the assembled unit including necessary supports; (4) the erection of these systems; and (5) the test of the elements before erection and of the completed systems after erection. It is intended to set minimum safety requirements expressed in language which is intelligible to all who design, manufacture, and erect piping systems, but not necessarily to cover the best practice known to the art. While in most cases the requirements are mandatory, design recommendations have been included where they will be of assistance in securing safe piping systems.

Practical Heating Book

HEATING DESIGN AND PRACTICE, by Robert Henderson Emerick. First Edition; 453 pages; size 6 by 9 in.; illustrated; cloth; published by The McGraw-Hill Book Company, 330 W. 42nd St., New York 18, N. Y.; 1951. Price $8.00.

Some time ago, the author, a consulting mechanical engineer, brought out a book on Basic Refrigeration and Air Conditioning. That book was an outgrowth of an experience he had during World War II, when he had the job of training a large force of men of various trades—pipefitters, machinists and so on—who had to install and repair refrigeration and air cooling machinery at one of the big Navy Yards.

He had to approach the subject so as to make the theories and principles of refrigeration and air conditioning understandable, regardless of the readers' formal education. He

is

coil-itis* increasing your temperature problem?

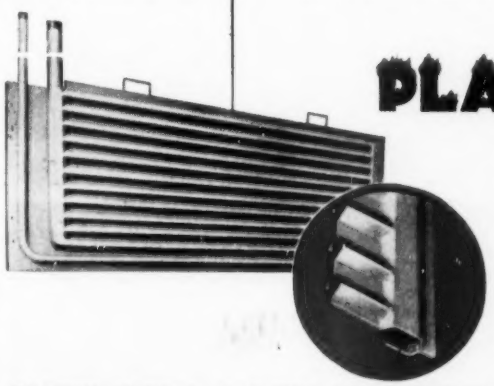
Here is a new treatment for solving your heat transfer problems that is as revolutionary as a new wonder drug. It stops coil-itis* cold . . . It eliminates the many troubles that have plagued industrial heating and cooling practices due to the use of old-fashioned, outmoded pipe coils. This revolutionary new unit, called a Platecoil, heats or cools 50% faster and takes 50% less space in the tank. It simplifies maintenance and saves hours of downtime.

Write for bulletin P80 today!

PLATECOILS SAVE 50% IN HEAT TRANSFER COSTS

PLATECOILS COOL QUENCH OIL TANK FOR ⅓ THE COST

At the K-D Manufacturing Company, Platecoils are proving more efficient, yet cost only 1/3 as much to install. Ask about other case histories.



PLATECOIL

REPLACES PIPE COILS

Coil-itis — Diagnosed as tank heating and cooling problems. Platecoils — the prescription for solving pipe coil problems.

PLATECOIL DIVISION, KOLD-HOLD MANUFACTURING CO., LANSING 4, MICHIGAN

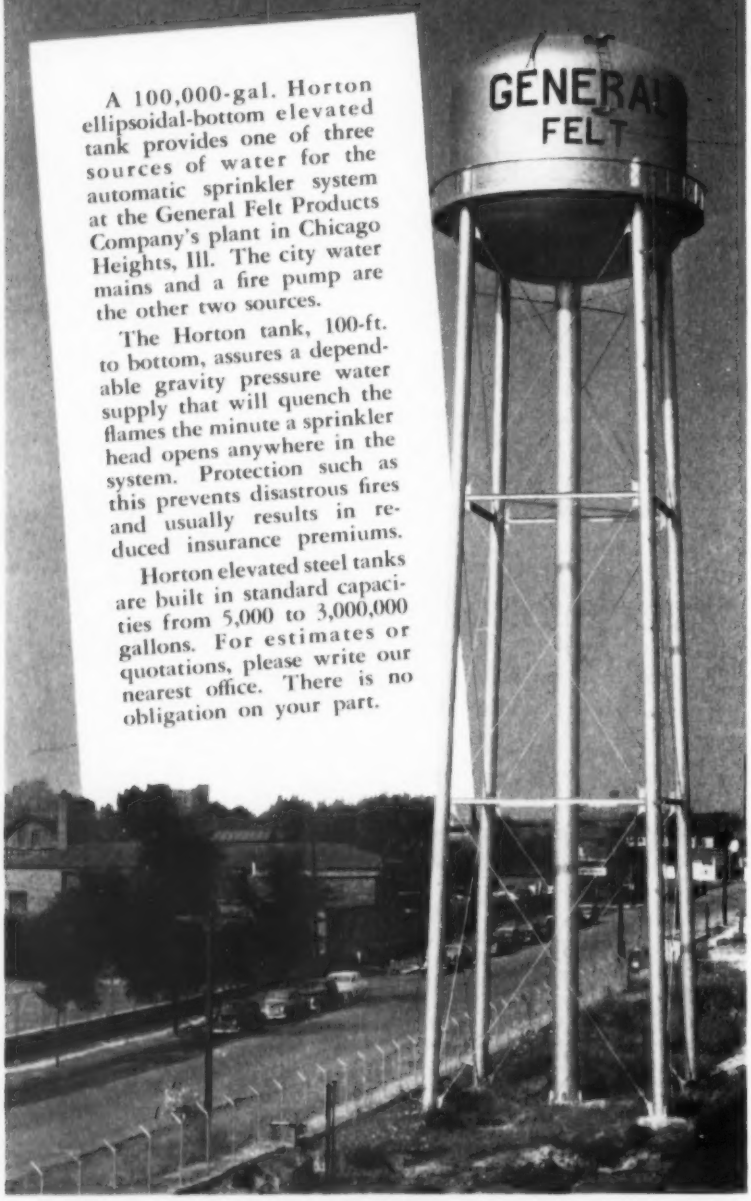
For more facts circle 624 on Reply Card

New HORTON Elevated Tank Means Triple Fire Protection

A 100,000-gal. Horton ellipsoidal-bottom elevated tank provides one of three sources of water for the automatic sprinkler system at the General Felt Products Company's plant in Chicago Heights, Ill. The city water mains and a fire pump are the other two sources.

The Horton tank, 100-ft. to bottom, assures a dependable gravity pressure water supply that will quench the flames the minute a sprinkler head opens anywhere in the system. Protection such as this prevents disastrous fires and usually results in reduced insurance premiums.

Horton elevated steel tanks are built in standard capacities from 5,000 to 3,000,000 gallons. For estimates or quotations, please write our nearest office. There is no obligation on your part.



CHICAGO BRIDGE & IRON COMPANY

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Birmingham 1	1555 North Fiftieth Street	Los Angeles 17	1574 General Petroleum Building
Boston 10	1067—201 Devonshire Street	New York 6	3317—165 Broadway Building
Chicago 4	2134 McCormick Building	Philadelphia 3	1649—1700 Walnut Street Building
Cleveland 15	2258 Midland Building	San Francisco 4	1582—200 Bush Street
Detroit 26	1569 Lafayette Building	Seattle 1	1370 Henry Building
Havana	402 Abreu Building	Tulsa 3	1669 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

worked out a method of doing so by first explaining basic principles and immediately following those with a practical, numerical example applying the principles with specific numerical answers to be reached. In the present book, he has followed much the same style and with similar good results.

He first explains how heating loads are calculated and how to design a steam heating system, then does the same for hot water heating and water heaters, also for warm air heating systems. He covers fans and filters, space heaters, the heat pump, combustion, chimneys, stack and flues, and how to choose a heating system; and the last chapter is a very practical one on specifications and the analysis of bids.

In our opinion, this is a very practical and helpful book based on a good deal of experience in designing and specifying exactly this kind of equipment.

Cost Control

HOW TO CONTROL PRODUCTION COSTS. Size 6 by 9 in.; 272 pages including complete index; illustrated; Author, Phil Carroll, Industrial Engineer. Published by McGraw-Hill Book Company, 330 West 42nd St., New York City. Price $5.00.

Men in the management group, outside of accounting, will find this a practical explanation of costs—an understandable guide in the fight to keep costs down and product quality up.

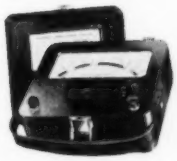
The book shows you how to get more accurate product costs and how to control them. A helpful new approach is taken in applying overhead expense; this is done first, in terms of conversion time and, second, in accordance with rates caused by the different products in multi-product industries.

In showing, step-by-step how to apply this effective control procedure, the author emphasizes five factors: the importance of accurate sales forecasts; controlling production to know deliveries, reduce inventories, and shorten the process cycle; saving excess finishes and tolerances with realistic engineering; using incentives; and reporting results promptly.

On Piping Work

PIPING DESIGN AND ENGINEERING. First Edition; 221 pages; size 8½ by 11 in.; illustrated; cloth; published by the Grinnell Company, Inc., Providence, R. I.; 1951. Price $10.00.

The aim of this book has been to compile in a single publication such engineering data and technical information as engineers will need for the design and application of pressure piping systems. Much of this information has hitherto been available

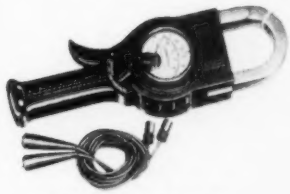


Model 622 – Ultra-Sensitive Instruments

Portable d-c and a-c thermo instruments for precision measurement of potentials and minute currents in electronics or laboratory research.

Model 901
Portable Test Instruments

Available in d-c, Model 901 —and a-c, Model 904, single and multiple ranges of wide coverage. Excellent scale readability and shielding. Accuracy within ½ of 1%.



A-C Clamp Volt-Ammeter

(Model 633, Type VA-1) For convenient and rapid measurement of a-c voltage and current without breaking the circuit. Jaws take insulated or non-insulated conductors up to 2" diameter. Safe, rugged, versatile. Also available as a-c clamp ammeter, without voltage ranges.

Specialized and Multi-purpose

INSTRUMENTS

for

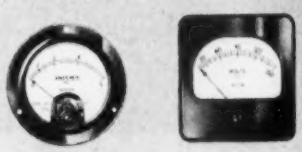
- **RESEARCH**
- **PRODUCTION**
- **MAINTENANCE**

For complex, or just routine measurement jobs, these and other specialized WESTON Instruments save time and assure dependable measurements. For information on the complete line, see your local Weston representative, or write . . . WESTON Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

WESTON
Instruments

Sensitive Relays

A line of sensitive relays including the Model 705 which provides positive operation at levels as low as ½ microampere. Non-chattering magnetic contacts handle up to 10 watts at 120 volts.

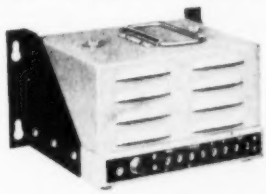


Panel and Switchboard Instruments

A complete line of instruments in all types, sizes and ranges required for switchboard and panel needs . . . including d-c, a-c power frequencies and radio frequency, rectifier types and D.B. meters.

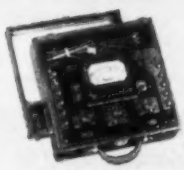
Model 697 Volt-Ohm-Milliammeter

One of a line of pocket-size meters, Model 697 combines a selection of a-c and d-c current, and resistance ranges. Ideal for maintenance testing and many inspection requirements.



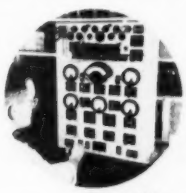
Model 1411 Inductronic D-C Amplifier

Stable amplifier provides high degree of resolution even at fractional loads. Reaches steady full scale deflection in a fraction of a second. Interchangeable plug-in range standards for either microamperes or millivolts.



Industrial Circuit Tester – Model 785

A multi-range, multi-purpose, ultra-sensitive analyzer, for laboratory and industrial checking of electrical and electronic circuits. Has 28 practical scale ranges; measures d-c and a-c voltage, d-c and a-c current, and resistance. Accessories available to extend ranges. Compact and portable; furnished in either oak or steel case.



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Electronic Tube Analyzer

Tests tubes under exact operating potentials. Accurately determines true mutual conductance of all tubes, in accordance with manufacturers' rated operating conditions, or under special operating conditions.

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only by consulting various books and articles. To this information the authors have added considerable material never previously published.

The book begins with a discussion of expansion and stresses and goes on to cover velocity and pressure drop calculations, then discusses heat transfer. A number of pressure-temperature pipe graphs are given, then a detailed discussion of piping materials. This is followed by complete coverage of pipe fabrication, then data tables and all necessary information on pipe hangers and supports. The book concludes with general engineering tables and there is a good bibliography of books and articles for reference.

The book is filled with tables, charts and numerical calculations, leading to practical answers and it seems to us that the objective has been well attained. This book should be of the most practical value to anybody having to do with design of practical piping systems.

Figuring Fuel Costs

BCR FUEL COST CALCULATOR. Size 3½ by 9¼ in.; in form of slide rule; published and distributed by Bituminous Coal Research Inc., 2509 First National Bank Building, Pittsburgh 22, Pa. Price 50 cents to non-members of the BCR association; 40 per cent discount to regular members.

This is a pocket size calculator designed for use by anyone having to do with fuel burning, but especially for those burning coal. This would include power engineers and personnel of coal burning plants, and, of course, coal company salesmen. It is designed to provide an easy method for making fuel cost comparisons and for computing coal consumption from boiler outputs.

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Lining Up Heavy Machines?

(Continued from page 130)

In adjusting the wire in the high pressure frame so that the pin stick will just touch the cylinder wall and wire at 90 deg positions, measurements are taken at both the front and back of the cylinder. Use this same procedure on the guides. A shorter pin stick is used in checking the stuffing box and drive shaft bearings.

Another reliable way of checking the exact alignment of the wire in the shaft bearings, and stuffing box, is by using a sighting block, see Fig. 4. This consists of a square faced hardwood block turned on a lathe to make a close inside fit. Two center lines are drawn on the block and a ¼-in. hole drilled in the center. Sighting alternately along these lines will indicate if the wire is in the center.

Carpenter's Square

In squaring up the wires, a carpenter's square is handy particularly on smaller machines. On the larger machines, with their correspondingly longer center wires, slight errors, unnoticeable on the carpenter's square, become objectionable at distances of 8 to 10 ft. A more positive method of measuring an extended right angle is by using the theorem,

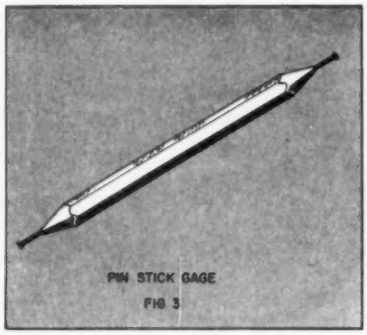

Fig. 3. Stick pin gage made of tapered wood and pins helps speed up the job

"The square of the hypotenuse is equal to the sum of the squares of the other two sides." From the intersection measure 6 ft on one wire and 8 ft on the other. The wires will be at right angles when the shortest distance between these points measures 10 ft. Measurements of any similar proportions may of course be used. Mark the wires by tying on a piece of fine thread or by crimping on a small piece of soft metal.

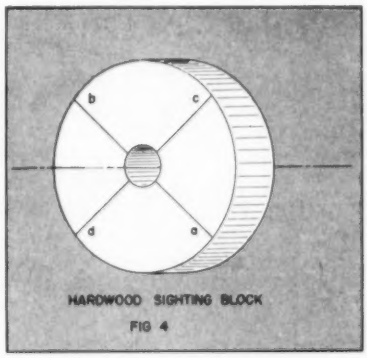

Fig. 4. Sighting block which is helpful in checking the exact alignment of wire

In the low pressure cylinder frame install and center a wire the same as in the high pressure cylinder frame with the exception that, in this case, the wire is fastened to the frame itself, rather than to the outside wooden standards. One end of the wire is fastened to a board, or flat iron, across the cylinder head and secured by opposite bolts. The other end is fastened to an adjustable bracket on the drive end of the frame.

If the unit's shaft bearings have not been shifted from their factory alignment, the center of this frame will be very close to a right angle with the drive shaft bearings so that leveling will be the only needed additional adjustment.

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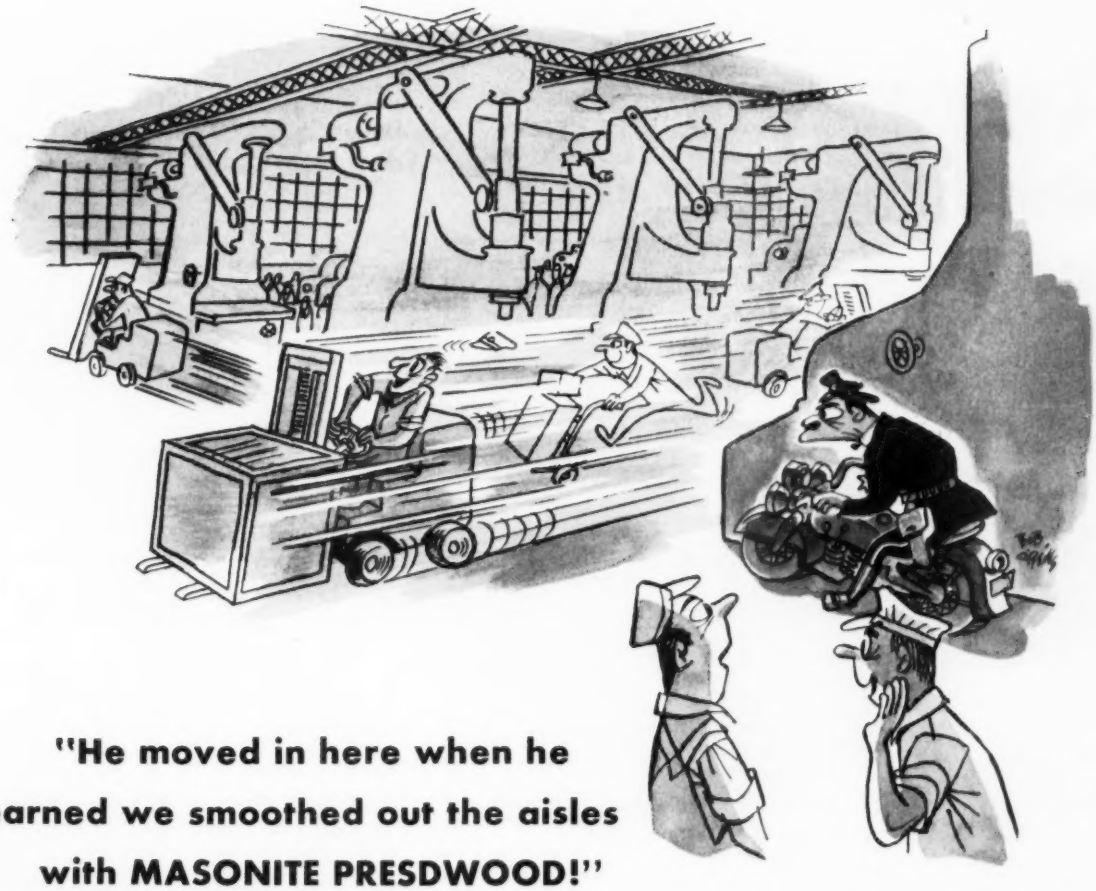

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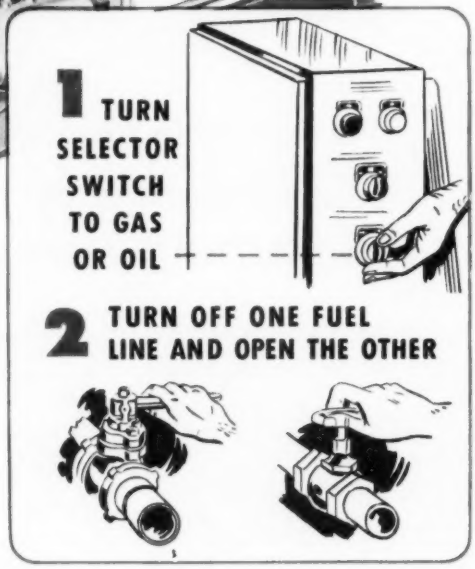

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(Continued from page 36)

cludes complete information on globe, angle and check valves in 300, 600, 900 and 1500 lb pressure classes. Parabolic disk valves for hand or motor control of volume are also described. In addition to standard information on construction features, dimensions and weights, booklet contains complete data on material specifications, preparation of welding ends, flange facings. Edward Valves, Inc.

130 Why Valve Diversatility—This 8-pp illustrated bulletin shows how manufacturer's use of three basic body designs in five types and five sizes provides nine control assemblies which meet a wide range of requirements. Some of the many variations of the control assemblies are pictured. Tells how system permits better valves without extra cost; how it lets plant engineer adapt valves to operating conditions. Valvair Corp.

131 Solenoid Valves, Switches—Circular VS-50 describes and pictures solenoid valves and automatic transfer and remote control switches and close differential and reverse current relays, also contactors designed for heavy duty industrial work. Valves shown include packless and packed shut off valves, safety shut-off manually reset valves, three-way pilot control solenoid valves, and four-way balanced piston valves. Automatic Switch Co.

132 Hydraulic Conversion Factor Table—Although detailed information is available on friction, velocity and friction head for fluids in standard steel and cast iron pipes, there is little such data on plastic lined, plastic, and light wall steel pipes. This table offers such information to those concerned with flow in other than standard steel pipes. The Permutit Co.

133 Answer Sheets on Plastic Pipe—Two illustrated leaflets present answers to 22 frequently asked questions about manufacturer's flexible and rigid plastic pipe. They tell what it is, how it is installed, how prices compare with those of metallic pipe and applications for which it is recommended. Also cover installation precautions. Carlon Products Corp.

134 Impulse Steam Traps—High capacity impulse steam traps for extra large volumes of condensate are the subject of Bulletin T-1745. Explains performance of trap; gives capacity data, construction materials, sizes, prices. Yarnall-Waring Co.

135 Industrial Steam Trap—Bulletin 351 introduces a new small size trap for individual drainage of small pieces of steam using equipment, or for use as an automatic air vent for mechanical traps, water heaters. Tells how trap is built, how it works. Gives sizes, capacities and prices. W. H. Nicholson & Co.

136 Uses of Purifiers—Eight-pp Bulletin 700 titled, "End Dirt and Moisture Problems the Hi-eF Way" describes uses of purifiers (mechanical separators) in many industries as well as in steam generation and distribution systems. Cutaway views show installations in 14 applications. Information is also given on the types of entrainment found in various vapors and gases. The V. D. Anderson Co.

137 High Velocity Air Distribution—Now available is an 8-pp illustrated discussion of engineering problems involved in high velocity air distribution. Covers supply air system, static pressure, fan selection, air volume control and distribution equipment. Barber-Colman Co.

138 Utility Blowers—Illustrated Catalog B-10, 24 pp, introduces this manufacturer's line of centrifugal blowers. Opening with a pictorial index of the full line, booklet gives detailed data on belt- and direct-drive units, pressure blowers designed to move large volumes of air against high pressures, and "Arrangement 3" (NAFM designation) utility blowers in sizes up to 48 in. Provides sizes, capacities, performance data. Hartzell Propeller Fan Co.

139 Fan Service Manual — One of the most comprehensive booklets available on fan usage, the new 72-pp edition of this pocket-size fan service manual provides detailed data on company's standard equipment. Illustrated throughout, gives helpful tips on the installation, operation and maintenance of fans, and covers drive arrangements, bearings, flexible couplings. Various types of fans are treated in detail—mechanical draft equipment, unit ventilating sets, propeller fans, air conditioning units, central system conditioners and others. Available to qualified plant engineers, please state title when requesting this book. Clarage Fan Co.

CONSTRUCTION AND MAINTENANCE

140 Roofing and Siding—Bulletin 47-2 is a 28-pp handbook of building coverage on roofing and siding designed to combine strength of steel with protection of asphalt and wearability of mineral mica. Gives specifications on corrugated and flat sheets, V beam, flashings and accessories. Explains erection procedure, application to wood and to steel structures. Includes discussion of engineering and fabricating services available. Plasteel Products Co.

141 Saving Ways in Door Ways—Bulletin 75, 32 pp, is a new edition of manufacturer's catalog on rolling doors, showing how they meet requirements of industrial doors and contribute to over-all efficiency, safety and economy. Covers service doors, fire doors and shutters, spring- and weight-counterbalanced bifold doors, roll-top overhead doors, steel rolling grilles and special closures. The Kinnear Mfg. Co.

142 Safety Treads — Here's a 36-pp pocket-size booklet covering practically every safety tread application. Includes illustrated plates, cross-section drawings, typical installations and specifications for company's Safe-Groove and abrasive cast treads as well as expansion plates, platforms, curb bars and floor grids. Various types, metals and surfaces are described. Booklet offers quick information to plant engineers concerned with the design, application, repair or purchasing of safety treads. Wooster Products, Inc.

143 For Floors that Take Punishment—Bulletin 653, 8 pp, describes Emeri-Crete flooring, a factory graded and packaged emery aggregate material for heavy duty industrial floors. Discusses advantages of emery aggregate in terms of increased strength, heat resistance, lower maintenance costs. Recommended specifications cover monolithic and granolithic finishes, resurfacing and patching of old floors, special applications and non-slip floors. Walter Maguire Co., Inc.

144 Clay Tile Setting Methods—The use of adhesives in installing clay floor and wall tile in industrial and other construction is discussed in 24-pp Booklet K-400 titled, "Thin Setting Bed Methods and Materials." Covers development of thin setting and its possible advantages and

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disadvantages; base surfaces; types of thin setting beds. Includes detailed specifications. Tile Council of America.

145 Closure Strips—Info-Bulletin 521 describes and illustrates closure strips of asphalt or rubber composition. These are premolded corrugated strips for sealing openings formed by installation of corrugated sheet metal or asbestos against flat surfaces, such as steel members of flashings, and for sealing walls against curbing. Uses of flat isolation strips for prevention of electrolytic corrosion by contact of aluminum sheeting with steel members, masonry or moist wood are also covered. Fabricated Products Co.

146 Framing Anchors—The uses of Teco Trip-L-Grip framing anchors in wood construction are described in this 7-pp booklet. Detailed drawings show how to use framing anchors in basic secondary joints in standard wood framing, and a table of technical data on safe design loads is included. Timber Engineering Co.

147 Glass Guide—Sixteen-pp Catalog 53, on industrial and other types of glass, is compiled for easy selection detailing the primary functions of the various products and presenting light distribution charts of each pattern. Includes technical information on Coolite, a heat absorbing and glare reducing glass, as well as tabular data giving maximum sizes, thicknesses and weights. Mississippi Glass Co.

148 Insulating Material—Ultrafine, a new thermal and acoustical insulation made of blown glass fibers, is the subject of this bulletin. Complete with photos of insulation in use and tables showing its efficiency, gives physical properties, principal uses, handling characteristics, thermal conductivity, and acoustical efficiency. Gustin-Bacon Mfg. Co.

149 Sound Control Products—Here's a 12-pp booklet providing information on a wide variety of acoustical and sound control products. Gives application data for Fiberglas textured, perforated and Sonofaced acoustical tile, ceiling board, Noise-Stop baffles, Aerocor, preformed insulation and insulating wool—products designed to combine sound absorption, high light reflection and good appearance with light weight, non-combustibility, dimensional stability. Owens-Corning Fiberglas Corp.

150 How to Combat Corrosion—"Where to Use Coal Tar Protection" is a new 8-pp illustrated guide to solution of corrosion problems. Presents practical suggestions and includes information on how and where coal tar protection can be used to advantage. Offers case histories to show how corrosion problems have been overcome. The Tapecoat Co.

DUST CONTROL

151 For Foundry Dust Control—Bulletin 1152, 28-pp, shows a complete line of dust control equipment for foundries. Latest information, installation pictures and diagrams of company's Multi-Wash collectors, Uni-flor hoods and Cupola collectors are included. Claude B. Schneible Co.

152 Central Vacuum Cleaning System—In 20-pp Bulletin D-5 diagrams and photos show company's Exidust central vacuum cleaning system designed to pick up dirt and dust by flexible hose and attachments and to pass them through a stationary piping system to collector separator tank or tanks. Tells uses of the system, names representative users, and gives design features. Sufficient engineering data are included to permit planning of an installation. Lamson Corp.

MATERIALS HANDLING

153 Heavy-Duty Truck—Ram and fork trucks in capacities from 12,000 to 60,000 lb are described in this 8-pp bulletin. Photos show trucks in action. Eleven models are described along with capacities and dimensions and a section is devoted to such engineering features as caster trail axle for easy non-reversible turning, and contactor control for low maintenance and heavy current-carrying capacity. The Elwell-Parker Electric Co.

154 Comparison Charts for MH Trucks—These two comparison charts cover riding and walkie type electric industrial trucks, both high and low lift and afford an objective point-by-point comparative analysis of various makes. The charts, with buying guides listed, provide a handy reference for plant engineers concerned with the purchase of either type truck. Charts are file folder size, printed on heavy stock. Lewis-Shepard Products, Inc.

155 Low-Lift Truck—A new riding type electric truck that speeds handling of skid platforms and skidded cases is described and pictured in Bulletin 750. Gives specifications and dimensions for this truck and for one for use with pallets, both of 4000-lb capacity. The Raymond Corp.

156 Industrial Elevators—Bulletin 5211, 32-pp, industrial elevators and portable cranes. Shows portable elevators in hand- and electrically-operated types in load capacities from 500 to 5000 lb. Also presents pallet elevators, barrel elevators, platform loading and balcony elevators; four-post elevators for heavy duty use and floor-to-floor stationary elevators. Characteristics are illustrated in details. Operating views show how storage capacity is multiplied by stacking goods ceiling high. Barrett-Cravens Co.

157 Bucket Elevators—Catalog 850, approximately 76-pp, offers engineering and application information on chain and belt bucket elevators, including centrifugal and positive discharge types, continuous bucket types and super-capacity models. Tells how to select a standard bucket elevator and provides a selection table giving suggested types for use with more than 80 different materials. Covers elevators, drive arrangements, buckets, ladders and platforms. Includes dimensions, specifications. The Jeffrey Mfg. Co.

158 Small Parts Elevator—Eight-pp Catalog 300 describes the Magnavator, a new automatic elevator for handling small parts magnetically. Seventeen advantages including low maintenance, handling of hot parts, ease of service, self feeding—are listed. Features and operation are explained and illustrated, equipment pictured. Six typical uses are sketched. Prab Conveyors, Inc.

159 Dumb Waiters—Hand-powered and electric dumb waiters are described and pictured in this bulletin. Answers questions as to types and uses, from simple record carriers and undercounter automatic brake units to elevators. Gives recommended applications, provides specification charts. D. A. Matot, Inc.

160 Conveyor Installations—Filled with photos of conveyor installations and pneumatic tube systems in use, 16-pp Bulletin 68 explains features of the equipment and shows advantages gained by its use. Installations pictured include munition plants, steel and brass mills, foundries, automobile factories and machine shops. Standard Conveyor Co.

161 Belt Conveyor—The Floor-Veyor, a belt conveyor for moving goods from floor

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to floor or horizontally is described in this bulletin. Gives specifications and features of the conveyor in chart and table form. Sketches show recommended installation procedures. The Rapids-Standard Co., Inc.

CHAIN, WIRE ROPE

162 Steel Detachable Chain—Although intended primarily for implement designers, this 48-pp pocket-size booklet is of interest to all who buy or maintain steel detachable chain. Explains manufacture of Rex steel detachable chain. Plain chain and attachments are illustrated. Tables of dimensions, weights, prices and strengths are included. Interesting drive and conveyor applications are illustrated. Other sections of book are devoted to chain theory, chain travel, recommendations for drives and conveyors, sprocket theory and design. Chain Belt Co.

163 Sling Chain Chart—Designed to make sling chain selection easier, this chart identifies types of chains and attachments which may be used for lifting any given load. Gives specifications, length and width of links, number of links per foot and other data. Working load limits are recorded in pounds. Back of the chart contains tips on the use and care of sling chains. The McKay Co.

164 Wire Rope Sling Handbook—Catalog FS-52 is the new 64-pp edition of this popular handbook on slings and fittings. Pocket size, it contains more than 100 illustrations showing standard slings, grommet slings, and multiple part slings both flat laced and hand braided. Charts show correct calculations for determining sizes required and correct sling angles in relation to loads. Company's new line of Red-Strand 8-part braided slings is featured. A. Leschen & Sons Rope Co.

MAGNETIC EQUIPMENT

165 Packaged Permanent Magnets—Eight-pp publication PM--10 present permanent magnets stocked in packaged quantities for the small user and available at new lot prices. Gives prices of cast and sintered permanent magnets, ground, unground, magnetized or not magnetized. Carboloy Dept., General Electric Co.

166 What Makes a Magnet?—A new chart showing the natural forces causing magnetism and how they are harnessed to create a useful tool first explains potential magnetic forces found in a ferromagnetic atom. How these natural forces are organized by the application of an external magnetic field is then presented. Eriez Mfg. Co.

METAL WORKING

167 Annealing of Malleable Iron—Bulletin GEA-5797, 12-pp, uses photos and diagrams to explain how to cut down over-all costs and how to shorten annealing cycles. It discusses the effects of temperature and analysis on the annealing cycle and describes the various types of furnaces which may be used in the process, including elevator, bell, roller-hearth and pusher-tray types. General Electric Co.

168 Drawing Metal—Twelve-pp Publication B-39 describes Formbrite, a metal said to be stronger, harder and springier than usual drawing brasses, yet retaining ductility. Lists physical properties and gives helpful information on pressroom and finishing room procedures. Case histories are reported to show how use of Formbrite contributed to better products at lower production costs. The American Brass Co.

169 For Improved Batch-Blasting—Twelve-pp Bulletin 223 on company's new Blasmaster Rotoblast illustrates construction features which makes this machine attractive to the foundry and metal finishing fields. Shows how production savings may be realized by use of this equipment, which is designed for the newer abrasives, to batch blast castings, forgings and heat-treated parts. Detailed dimensions and specifications given. Pangborn Corp.

170 Hardness Conversion Tables—Here's a handy wallet-size celluloid card showing hardness conversion tables for steels. Gives approximate relationship between Brinnell, DHP(Vickers), Rockwell and Shore Scleroscope hardness values and corresponding tensile strengths of steels. The International Nickel Co., Inc.

OTHER EQUIPMENT

171 Electric Tool Ordering Book—Forty-pp Catalog 39 provides illustrated ordering information on portable electric tools, including drills of all types, grinders, polishers, sanders, tappers, hammers, saws, impact wrenches, valve shop equipment. Independent Pneumatic Tool Co.

172 Equipment for Buildings and Institutions—Bulletin WP-1099-B27M is a newly-revised booklet of condensed information on sizes, dimension, capacities, ratings and features, of a wide range of air conditioning equipment. Covers refrigeration products, with auxiliaries; oil, gas and dual fuel engines, deaerators and deaerating heaters; water conditionings; steam turbines and turbine generators; liquid meters; centrifugal and other pumps. Worthington Corp.

173 Insulation Specifications—This 52-pp brochure on insulation specifications for oil refineries and chemical process plants is offered as a quick reference source for those who must specify such thermal insulations. Specifications are written for economy of operation, better control of process temperatures and safety of both personnel and equipment. They cover insulations for temperatures above 100 F, those for temperatures below 100 F, tank insulations, and oil heater insulations. Johns-Manville.

174 Planning to Use Color?—This little 20-pp booklet is a bibliography of available publications related to color standards and codes, giving author, source price etc. Includes guides on military camouflage colors, piping identification colors, industrial finishes, safety colors, paint pigments, and a wide range of products in which standard colors are a factor. Research Div., Faber Birren & Co.

175 Jet Pulverizers—What jet pulverizers can do in the industrial and chemical fields, in combustion and in exfoliation is told in this 8-pp folder. Illustrated with a king-sized cutaway drawing of a pulverizer, text explains how this steam-, gas-, or compressed-air-operated unit works to pulverize solid material in fine grinding, fuel pulverizing, defiberization, drying, mixing. Stresses improved engineering. Majac Engineering Co.

176 Improved Industrial Waste Treatment—Bionetic, a powder consisting of living micro-organisms together with their enzyme systems, is the subject of this bulletin. Arranged in logical question-and-answer form, text explains how Bionetic improves biological activity in waste treatment, discusses types available, and stresses advantage of continuous creation of suitable enzymes through the life cycle of living organisms. Selection of proper Bionetic and application to a particular plant system, how to test for results, continued dosage, are also covered. Reliance Chemicals Corp.

177 Packaged Steam Generators—Bulletin 525, 12-pp, describes packaged generators designed to give full steam pressure within 2 min from a cold start. Discusses features of the generator, stresses advantages for stationary boiler plants and for process steam and other applications. Fully illustrated, includes engineering specifications for standard units from 18 to 450 hp. Vapor Heating Corp.

178 Coolers and Evaporators—Excellent selection data on company's CWF (chilled water with Freon) direct expansion evaporators and shell and tube coolers are presented in 8-pp Form 520809. Gives step-by-step directions for determining proper model, includes dimensions, weights, prices. Taco Heaters Inc.

179 Radiant Heating, Cooling—This interesting folder provides a discussion of radiant heating and cooling and the practical application of radiant energy heating to human comfort conditioning. Includes drawing and photo of a multi-purpose functional ceiling affording radiant heating, cooling and acoustical control. Burgess Manning Co.

180 Work Gloves—This 12-pp catalog presents a company's Jomac line of industrial work gloves. Many styles are illustrated and listed, including abrasion resistant gloves, flame and heat-resistant gloves, Glov-Safers and special hand pads and sleeves. C. Walker Jones Co.

DATA FILE of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 35-36 and 197-198

VENTILATING, DEHUMIDIFYING, AIR CONDITIONING

201 How Conditioning Units Can Help—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water, steam heating. Clarage Fan Co.

202 Putting Air to Work—Catalog 600 is an excellent, 60-pp reference text on air and products to put it to work. For plant engineers concerned with heating and ventilating of plant areas; air conditioning installations; means of exhausting fumes, gases and dusts; conveying chips and granular materials; elimination of airborne dirt—this book is a valuable tool. It's packed with information on selecting and applying equipment, and there is a section of frequently-used reference data. Sturtevant Div., Westinghouse Electric Corp.

203 Air Conditioning Cabinets—Engineering Bulletin 3703A, 40-pp, describes and illustrates manufacturer's Model G cabinets, central units available in both horizontal and vertical models, providing 875 to 22,000 cfm and offering combinations for any function or functions of air conditioning. Booklet gives construction details, discusses heating and cooling coils. Buffalo Forge Co.

204 Fans and Blowers—Illustrated Catalog 21A, 64 pp, gives ordering information on company's fans, blowers, roof ventilators and related products, including application suggestions, ratings, dimensions. Explains principle of curved orifice air-seal ring incorporated. Provides directions for installation and operations, maintenance and lubrication. Hartzell Propeller Fan Co.

205 Heating, Air Conditioning Book—Bulletin PB-290, 36 pp, is a complete, condensed catalog covering company's full line of air conditioning, heating, ventilating and heat transfer equipment. Supplements some 40 specialized bulletins on various product lines. The Trane Co.

206 Industrial Exhaust Fan—Housing design, wheel construction and standard arrangements of manufacturer's Type EX exhausters are discussed in illustrated Bulletin C-46EX. Provides capacity tables, dimensions and photos of standard and special fans. Bayley Blower Co.

207 Induced Draft Fans—Manufacturer's induced draft Bifucator fans, said to provide controlled draft for boilers and furnaces at all times, are the subject of this

DATA FILE

(Begins on page 199)

8-pp Bulletin DB-32-52 catalog. Illustrations, specifications and dimensions of these fans in 24 sizes for both high pressure and low pressure boilers are provided. DeBothezat Fans Div., American Machine and Metals, Inc.

208 Hospital Ventilation—Bulletin 1510, 20-pp, covers modern practices in hospital ventilation. Explains general ventilating needs, discusses recommended air changes. Photos show solutions to particular ventilating problems and cover use of company's equipment in large and small, old and new hospital buildings. Also illustrates fans, roof ventilators, unit heaters. Ilg Electric Ventilating Co.

209 Roof Ventilators, Louvers—Now available to qualified plant engineers is a collection of literature on gravity and powered roof ventilators and ventilating louvers. Includes a résumé of engineering helps for working out a ventilation problem—a guide for estimating ventilating requirements, installation procedures, sizes and capacities. The Swartwout Co.

210 To Keep Out Moisture—Vents designed for easy installation on any roof to keep out wet, foul air are described in this literature. Muckle Manufacturing Co.

211 Vaneaxial Fans—Bulletin J-611 is a 16-pp booklet presenting company's Axivane Series 1000 fans. Explains advantages of vaneaxial design and the versatility afforded by adjustable blades for ventilating and other industrial applications. Fans in this line consist of 136 models from 18 to 84 in. dia., volumes to 150,000 cfm. Photos of typical installations included. Joy Mfg. Co.

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212 Tubing for Many Jobs—Flexible tubing for ventilation, fume and dust removal as well as materials handling is described in 8-pp Catalog C2-4. Gives detailed information on company's Spiratube A and Spiratube R, two types of lightweight tubing made from continuous helical coils of spring wire wound with overlapping plies of fabric. Gives applications of both types. Flexible Tubing Corp.

DUST CONTROL

213 Wet Method Dust Collection—Besides presenting company's line of Multi-Wash dust collectors, dewatering tanks and pumps, 22-pp Bulletin 510 explains advantages of wet method of dust control, discusses both simple installations and those requiring additional equipment. Covers in detail the widely used Senior collector, the Junior collector for single function operations, settling and dewatering equipment. Claude B. Schneible Co.

214 Dust Control—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes dust control equipment, providing specifications, dimensions on filters, systems, automatic controls. The W. W. Sly Mfg. Co.

215 Dust Recovery—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoints of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

216 Dust Control Technology—Detailed selection, operation and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment, exhausters and drives. Lists basic methods of dust control and analyzes elements of exhaust systems. Pangborn Corp.

217 Manual of Exhaust Hood Design—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. American Air Filter Co., Inc.

218 Tubular Dust Filters—Advantages, uses and design of tubular dust filters are given in Bulletin 24-D. Presents both single compartment and automatic continuous multi-compartment units. Describes bag shaker mechanism, dust discharge valve, dust hoppers. Ruemelin Mfg. Co.

219 Dust Control Brochure—Dust and fume control in many industries is the subject of this comprehensive 24-pp booklet. Tells how cloth-tube type dust collectors are handling complex problems in 33 typical installations, all illustrated. Covers use of these collectors in chemical processing, coal cleaning, sewage disposal, many other applications. American Wheelabrator & Equipment Corp.

220 Dust Collectors—Operation, construction, versatility and maintenance of company's unit dust collectors are explained in this bulletin. Includes capacities, sizes. The Kirk & Blum Mfg. Co.

HEATING, COOLING

221 Heating Equipment and Systems—Sixty-pp Catalog G-99 presents up-to-date ordering information on company's heaters and hot water heating specialties, also design tables and engineering data for venturi systems, two-pipe reverse return systems, panel heating systems, snow melting systems. Contains a parts list and section on servicing of circulators, valves, flow checks. Taco Heaters, Inc.

222 What Unit Heaters Can Do—Featuring many photos showing how unit heaters are being used to provide heating comfort, cut fuel costs, provide economical air circulation, 8-pp Bulletin 149-A discusses

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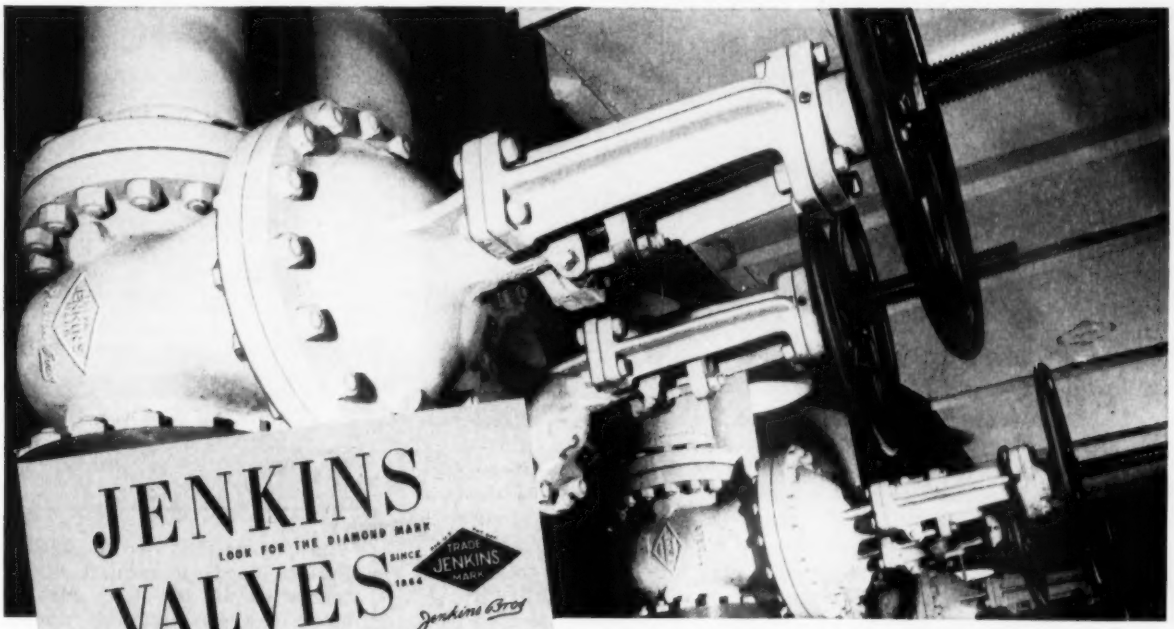

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DATA FILE

(Begins on page 199)

advantages of these heaters and includes performance data. Modine Mfg. Co.

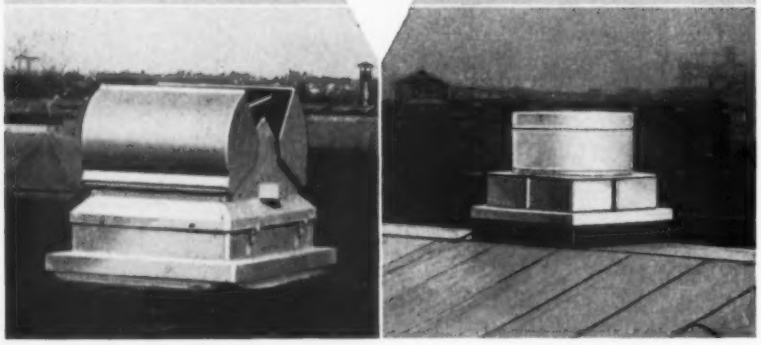
223 Engineering Data for Heating Systems—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28-pp. Detailed, illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures, and pipe dimensions. C. A. Dunham Co.

224 Faster Tank Heating, Cooling—Bulletin IP-250, 8 pp, describes company's Platecoils, embossed metal sheets welded to form compact units through which required heating, or cooling, medium is circulated under pressure. Explains lower costs, faster tank cooling or heating, lighter weight and compactness of these units. Kold-Hold Mfg. Co.

225 Heat Transfer Equipment — An excellent source of information on shell and tube heat transfer equipment, 28-pp Catalog DM-1150 covers heat exchangers, tank suction heaters, oil preheaters, condensers, evaporators, after-coolers, gas coolers, centrifugal pumps and water heaters. Instructions for installation, operation and maintenance are included. Bell & Gossett Co.

226 Jacket Water Coolers—Illustrated Catalog 1351 describes a line of engine jacket water coolers described as extremely rugged units capable of withstanding abuse of portable equipment installations. Details new design features of the units. Young Radiator Co.

Swartwout "Straight Through" Ventilators provide efficient economical spot ventilation



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BOILERS, GENERATORS

227 Re-Circulation Steam Generator — Here's a 6-pp folder introducing a controlled re-circulation steam generator, describing its developments and uses. Combustion Engineering-Superheater, Inc.

228 How Much for Steam — Here's a "slide rule" calculator for computing steam costs. It's pocket-sized, and enables a plant engineer to find comparative steam costs per 1000 lb, using coal, oil or gas, and based on fuel costs of price per ton, gallon, cubic foot. Cleaver-Brooks Co.

229 Shop-Assembled Boiler — Sixteen-pp Bulletin G-76, completely describes and illustrates company's Type FM water-tube integral-furnace boiler, made in standard sizes from 2900 to 28,000 lb of steam per hr, pressure to 250 psi. Capacities, dimensions given. The Babcock & Wilcox Co.

230 Oil or Gas Fired Automatic Boilers —Boiler, burner, controls and safety features of 10 to 500 hp oil or gas fired automatic boilers are described in this 4-pp bulletin. Firing rates, dimensions and capacities are given for all models. Boiler Engineering & Supply Co., Inc.

231 Steam Generators—Bulletin 1218 on company's Powermaster units for steam or hot water use. Describes high or low pressure units from 15 to 500 hp. Gives details on special burner design and units' ability to be changed from oil to gas firing in minutes. Orr & Sembower, Inc.

PUMPS, COMPRESSORS

232 Centrifugal Pump Handbooks—Two instruction booklets covering installation, operation and repair of company's single-stage single-suction and multi-stage centrifugal pumps are available. They include illustrated description of such late developments as Magic-Grip couplings, universal joint couplings with Magic-Grip bushings, mechanical seals. Suggest regular inspection procedures and include pages for maintenance records. Also provide handy reference tables explaining how to locate trouble and listing causes and cures. Bulletin 08X7813, 24 pp, covers single-stage pumps; Bulletin 08X7780, 48 pp, covers the multi-stage pumps. State choice or both. Allis-Chalmers Mfg. Co.

233 Installing a Pump — Blaming many pump operating troubles on improper pump selection and installation, this 8-pp technical article tells what should be taken into consideration when ordering a pump. Titled, "Studying the Installation," it discusses head, viscosity, pipe friction, suction lifts, horsepower and materials. Illustrated. Viking Pump Co.

You may use the two Reader Service Cards to request information on ads, too. Just circle the key number appearing at bottom of ad.

234 "A Turn for the Better" — Bulletin 30-B, 8 pp, discusses manufacturer's improved Moyno pump, explaining in detail its progressing cavity feature and showing how the rotary motion created provides continuous flow at positive pressure. Stresses performance advantages of the pump. Pump Div., Robbins & Myers, Inc.

235 Pump Service Manual—Bulletin 202 is a 20-pp booklet covering installation, operation and maintenance of manufacturer's reciprocating pumps and providing helpful engineering information. Suction piping, valves and accessories for proper operation are discussed. Sectional drawings and parts lists are provided, also high and low capacity steam consumption curves, general information on water, properties

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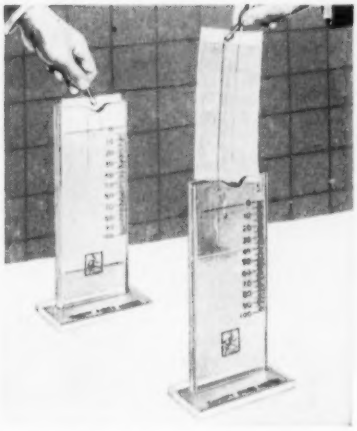

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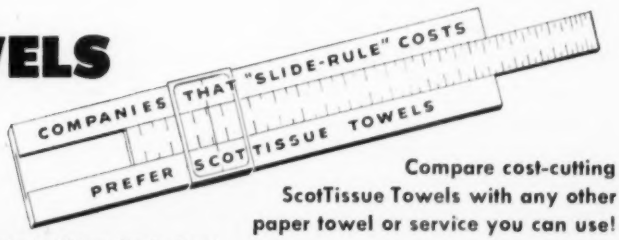

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DATA FILE

(Begins on page 199)

of saturated and superheated steam. Warren Steam Pump Co., Inc.

236 Condensed Pump Data—Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications, and features. Goulds Pumps, Inc.

237 How to Solve Pumping Problems—A new printing of this popular 36-pp booklet makes it again available to plant engineers. Filled with helpful technical information, explains design and operation of rotary gear pumps and discusses factors of pumping problems, covering some sample ones in detail. Illustrated, provides friction loss and conversion tables, electrical data, viscosities of liquids, construction materials for handling various liquids, resistance of valves and fittings to flow of fluids. Geo. D. Roper Corp.

238 For Abusive Pumping Jobs—Catalog 4906, 36-pp, covers centrifugal pumps for wide industrial use and especially adapted to handling ashes, abrasive mixtures, slurries, hot and corrosive liquids. It describes several basic types; a horizontal shaft, single-stage side suction pump; a horizontal shaft, single-stage, rear-entrance automatic priming pump; vertical shaft pumps with standard, overhead and quill bearings for wet pit use. Nagle Pumps.

239 Air Compressor Selection Data—Factors to be considered in selecting a compressor are discussed and selector charts provided in 20-pp Bulletin IDC 9302-3, covering manufacturer's Y and G air compressors. The Y line includes tank mounted and bedplate units, single- and two-stage types. Special features of each model are described, dimensions and ratings given. Westinghouse Air Brake Co.

"I'd stir awhile, Jones, only I'm left handed."

240 Multi-Stage Compressors—Featured in 36-pp Bulletin 116 is a presentation of engineering data and performance characteristics to enable plant engineers to approximate power requirements, rotative speed and discharge temperature for most multi-stage centrifugal compressor applications. Clark Bros. Co., Inc.

241 Centrifugal Compressors—Twelve-pp Bulletin 109 describes and pictures single-stage centrifugal compressors for delivering large capacities of pulsation-free air or gases. Their functions, applications, ratings, construction features, arrangements and methods of control are presented. American Blower Corp.

242 Improved Compressor—How this manufacturer's Spiraxial compressor for

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Warsaw, Indiana

Electric Steel Foundry Company
Portland, Ore.

Erie Malleable Iron Company
Erie, Pa.

Fahralloy Limited
Orillia, Ont.

Fairbanks, Morse & Company
Kansas City, Kan.

Hammond Brass Works
Hammond, Ind.

Haynes Stellite Company
Kokomo, Ind.

Macfarlane
Sagua la Grande, Cuba

Moline Malleable Iron Company
St. Charles, Ill.

National Roll & Steel Foundry
Avonmore, Pa.

Pittsburgh Steel Foundry Corporation
Glassport, Pa.

Pyle-National Company
Chicago, Ill.

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DATA FILE

(Begins on page 199)

air or gas is designed to provide peak efficiencies with minimum servicing is explained in Bulletin SC-152. Construction and design details are discussed in detail. Roots-Connersville Blower.

PACKINGS

243 Metallic Packing—This folder is devoted to company's elastic metallic packing intended for frictionless operation by means of an oil seal. Photos and text tell how seal is constructed, operates and is used. A. W. Chesterton Co.

244 Data on Packings—Form 428 is a collection of bulletins on flexible metallic packing, semi-metallic packing, rotary mechanical seal, oil pressure system and steel packing tools. Durametallic Corp.

VALVES, TRAPS, PIPING AND ACCESSORIES

245 Efficient Flow Control — Data on bronze, iron, steel and corrosion-resisting valves in a wide range of types, for oil, water, gas and low pressure steam. Shows how valves are designed for service, low maintenance. The Wm. Powell Co.

246 For Quick Valve Selection — Here's a 20-pp catalog digest providing ordering and application information on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated and thumb-indexed, includes pressure-temperature chart. The Ohio Injector Co.

247 Small Steel Valves—Illustrated Circular 134 describes a line of small cast steel valves for high pressure service. Tells how valves are built, where to use them. Gives dimensions, weights, prices on both globe and angle types. Walworth Co.

248 Automatic Valves — Pressure, flow, and liquid level controls for steam, air, gas and fluids are shown in 90-pp Catalog A-50. Includes sizes, prices, capacity charts, conversion tables. Davis Regulator Co.

249 Valve Maintenance Guide — "Prevent Valve Failure Before It Starts," is a 28-pp text on valve selection, installation, inspection. Pictures damaged valves, explains how damage could have been prevented. Discusses maintenance schedules, inspection jobs, lubrication, pipe line checking, threading, regrinding, disc replacement. Jenkins Bros.

250 Solder Joint Valve — Bulletin 103 describes a 100-lb valve for use with copper tubing. Gives working pressures, temperatures. Tells how to install a solder joint valve. The Kennedy Valve Mfg. Co.

251 Valves and Fittings—Illustrated Catalog 47 provides over 60-pp of ordering information and application data on valves and fittings made of stainless steel and other corrosion resistant alloys designed for use where corrosion or contamination are factors. Gate, globe, and angle valves for a wide range of services are presented, also needle valves, sampling valves, screwed and flanged fittings. Design and construction details are shown. Also included is a chart of first and second recommendations of alloys for corrosive media. Alloy Steel Products Co., Inc.

252 Reducing Valve Engineering Data—Bulletin 962 explains how the contour of a pressure reducing valve contributes to efficiency of performance. Discusses straight-line flow, tight closing. A. W. Cash Co.

253 Steam Trap Reference Manual—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure trap sizes and how to size condensate

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DATA FILE

(Begins on page 199)

return lines are told and capacity and pipe dimension charts and thermodynamic properties of saturated steam included. Yarnall-Waring Co.

254 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculators, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

255 Steam Trap Book—Catalog J, 44 pp, includes physical data and prices on cast semi-steel and forged steel inverted bucket steam traps, compound steam traps and ball float air and air relief traps; a handbook section explaining how to calculate condensate loads and select traps for all classes of equipment; a maintenance section. Armstrong Machine Works.

256 Solving Steam Trap Problems—This popular 36-pp catalog on steam traps contains specifications and capacities on steam traps, float traps, air release valves and pipe line strainers. Tells how to calculate condensation loads and select traps for all classes of equipment, including unit heaters, jacketed kettles, autoclaves, submerged surfaces, steam mains and header drips. Gives pointers on how to install traps and service them. The V. D. Anderson Co.

257 Steam, Air and Gasoline Traps—Catalog 751, 32 pp, is a recently issued trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressures up to 1500 lb; separators. W. H. Nicholson & Co.

258 Manifold Discharge Piping Application—Manual 51-B, 34 pp, proposes an approach to design of discharge header systems based on partial or complete elimination of back-pressure effects on tied-in safety-relief valves. This principle is claimed to offer greater savings in cost of discharge piping. Farris Engineering Corp.

259 Industrial Gaskets—This highly informative 50-pp catalog covers an extensive line of gaskets and teflon products, including practically all types of metal, metal-asbestos and special gaskets as well as teflon stock. Includes both engineering and ordering data, application and installation tips. United States Gasket Co.

260 Handbook on Fittings, Flanges—Catalog wf-1950, 68 pp, offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

261 Packless Expansion Joints—Bulletin 35-51A offers 28 pp of up-to-date information on company's Corruflex joints, their design and installation and advantages over other means of providing for thermal expansion in pipelines. Construction features are explained and illustrated; simplified selection data include tables for determining amount of expansion in pipelines. American District Steam Co., Inc.

262 Piping Pointers—This is company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.

263 Welding Fittings—Catalog 3 is a 36-pp ordering and engineering reference book on company's Weldolets for piping services. Gives data on butt-welding and socket welding Weldolets as well as on Thredolets for making threaded outlets. Typical installations are pictured; sizes, weights and prices provided. Also included are installation instructions and a technical section covering material specifications, design principles, code data. Bonney Forge & Tool Works.

264 Unions and Fittings—Twelve-pp Catalog 50 covers manufacturer's line of unions of all types, elbows, tees and fittings. Dart Union Co.

INSTRUMENTS, CONTROLS

265 Fundamentals of Instrumentation—Booklet 80-2 illustrated, offers 126 pp of information on instrumentation in industry. Separate sections are devoted to the fundamentals of measurement and control, measurement of process variables, remote transmission of measurements, automatic controllers, power units and final control elements, control systems and panelboards. Available to qualified plant engineers. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

266 Wide Range Regulator—Featured in Bulletin 316 is an expansion stem type temperature regulator operated by water or compressed air. Explains how regulator works. The Powers Regulator Co.

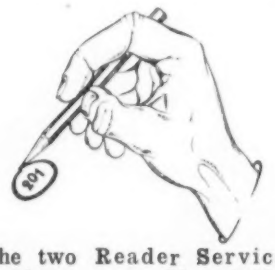
267 Gages for Many Jobs—Sixty-eight pp of liberally illustrated information is offered in Catalog 64. Describes a variety of gage types; air volume controls for pump installations, vapor tension thermometers, d-c ammeters and voltmeters, and water flow meters covered. Includes engineering tables. United States Gauge Div., American Machine and Metals, Inc.

268 Handbook on Automatic Controls—Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature pressure-low water, liquid level, bottles; transformer-relays, valves. The Mercoid Corp.

269 For Liquids Worth Storing—Bulletin 6405 offers an illustrated discussion of company's self-contained gages for liquid level applications, covering both direct- and remote-reading types, also a dial type hydrostatic gage. Stresses value of measuring stored liquids. Liquidometer Corp.

270 Electrical Instruments—A line of instruments for production testing, plant maintenance and service is shown in 16-pp Bulletin A-16-B. Among these are a-c clamp volt ammeters and a-c clamp ammeters, circuit testers, analyzers, mutual conductance tubechecker, pocket-size meters. Weston Electrical Instrument Corp.

271 Steam Calorimeter—Bulletin 118 discusses an improved U-path calorimeter combining a throttling, separating and re-evaporating calorimeter in a single chamber. Explains construction and operation of the unit. Ellison Draft Gage Co., Inc.



The two Reader Service Cards on pages 36 and 198 are easy to use and need no postage. Just circle the item number of catalogs wanted, fill in name and company, etc., and mail the card.

ELECTRICAL

272 Buyers' Manual on Motors and Control—Fifty-pp Catalog GEC-1009 presents buying information on a carefully selected group of motors, motor starters, control accessories and electronic control. Ratings listed are those most frequently required. Excellent selection data, dimensions, ratings and prices. General Electric Co.

273 Motor Control—A handy reference book on modern motor controls, comprises 76 pp of condensed information, dimensions and prices of the most popular items in company's line. Covers a-c manual and magnetic across-the-line switches; a-c voltage starters, control relays and contactors; synchronous and high voltage starters; d-c control relays, contactors, starters; drum switches, a-c d-c rheostats, speed regulators, etc. Allen-Bradley Co.

274 Motor Handbook—Bulletin MU-185 provides 66 pp of engineering and descriptive data on motors, covering splash-proof and explosion-proof types, gear motors, motors for use in chemical plants, for oil well pumping, punch presses, elevators, cranes and hoists. Wagner Electric Corp.

275 Totally-Enclosed Motors—Eight-pp Form 1784, illustrated in full color, presents a line of totally enclosed motors, including types for both hazardous and non-hazardous locations. Design details of the motors are shown in a large cutaway drawing, and special construction features are pictured. U. S. Electrical Motors, Inc.

276 Motor Panorama—Motors and generators—about 50 types in all—are pictured in Publication AEB 100.8B, which serves as a handy reference, since it lists specific literature dealing with each motor shown. Gives general construction details of each unit. Fairbanks, Morse & Co.

277 Distribution Duct Engineering Data—Bulletin 427-4 contains 32 pp of data for estimating ventilated duct for feeder, circuits, plug-in duct, and plug-in duct for branch circuits. Includes instructions for laying out distribution duct jobs, and pointers on estimating diagrams, layout symbols. BullDog Electric Products Co.

278 Bus Duct Manual—Booklet B-4272A, 68 pp, on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct for a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors, etc. Westinghouse Electric Corp.

279 Plug-In Power—Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, materials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Feedrail Corp.

280 Power Distribution Feeders—Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution systems, gives construction, engineering, application data. Trumbull Dept., General Electric Co.

281 Power and Control Cables—Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Rome Cable Corp.

282 FHP Manual Starters—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual. List applications for these starters and pictures variety of enclosures available. Square D Co.

283 Circuit Breaker Reference Data—Catalog Section 5000 is a collection of more than 30 data sheets providing selection and application information and ordering instructions for company's molded case circuit breakers. Fully illustrated, includes ratings, current carrying capacities, dimensions, prices. I-T-E Circuit Breaker Co.

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(Begins on page 199)

284 Snap Action Switches — Catalog 82, 23 pp, on precision snap-action switches, presents safety, limit, and interlock types designed especially for switching a-c circuits in industrial applications. Covers heavy-duty limit switches, metal enclosed switches, some of which are sealed against dirt, dust, splashing. Micro Div., Minneapolis-Honeywell Regulator Co.

285 Overload Relays — Bulletin 1180-3 is a technical data sheet on overload relays designed to combine advantages of thermal and magnetic tripping characteristics for protecting a-c motors. Pictures design details. The Electric Controller & Mfg. Co.

286 Batteries for Lift Trucks—Bulletin IT-517 explains why company's Slyver-Clad batteries are designed to give longer and more efficient service and cost less to operate. C & D Batteries, Inc.

Postage-free Reader Service Cards make it easy to order any of this literature. See pages 35-36 and 197-198.

287 Battery Technology Handbook—This is a 56-pp revised edition of company's manual of technical instruction and engineering data on the care of motive power storage batteries. Major addition is a section on charging, which includes information on modified constant voltage and two-rate charging, boost, equalizing and emerging charging, control of discharge, etc. Other sections cover the theory of the lead-acid battery; practical tips on care and operation; maintenance and repair. Gould-National Batteries, Inc.

288 Preventive Maintenance Tips—Booklet B-5477, 28 pp, discusses programs designed to reduce shut-down time on production lines and treats in detail the maintenance of power equipment. A suggested schedule of work and cleaning on power equipment is presented in chart form. Essential information on preventive maintenance for turbines, generators, switchboards, motors and controls is given. Westinghouse Electric Corp.

289 Electrical Equipment for Cranes — A complete line of electrical equipment designed exclusively for crane service is presented in 32-pp Bulletin C5-1. Covers everything from company's a-c Magnetorque crane control to current collectors, and is generously illustrated. Overhead Crane Div., Harnischfeger Corp.

290 Flexible Cords—This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives information on cord selection, how to order specialties. Whitney Blake Co.

LIGHTING

291 Plant Lighting Planning Guide — This 32-pp handbook of industrial lighting presents economics of a plant lighting program in terms of lower production costs, reduced working time, less fatigue and eyestrain, less spoilage, fewer accidents, better morale. Explains six major steps in initiating, developing and carrying out a lighting program; tells how to select equipment and stresses importance of maintenance. Includes table of recommended levels of illumination for industrial interiors. Benjamin Electric Co.

292 Lamps for All Purposes—Catalog 53-54-E is an excellent 28-pp buying guide

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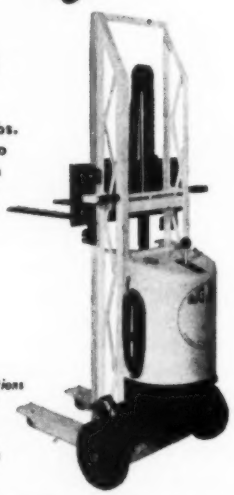

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(Begins on page 199)

for a wide range of incandescent, fluorescent lamps. Fully illustrated, presents helpful application information. Features full color photos showing the effect of various types of fluorescent lighting. Duro-Test Corp.

293 Lighting Fixtures—Full information on company's fluorescent lighting fixtures designed for efficient industrial lighting and reduced maintenance is provided in Form OD-568. Day-Brite Lighting Inc.

294 Precision Lamps—Bulletin 40 offers application and purchasing information on various types of lamps carried by manufacturer. Flood, infra-red, spatterproof, and weatherproof lamps are briefly discussed. Radiant Lamp Corp.

295 Selection Data on Lighting Fixture Hangers—Catalog 50, 80 pp, contains general and detailed information on disconnecting and lowering lighting fixture hangers, accessories, special devices and parts. Utilizes 247 photos and drawings to show construction principles, operating features, installations, modifications and component parts for both indoor and outdoor units. The Thompson Electric Co.

MECHANICAL POWER TRANSMISSION

296 Variable Speed Control Simplified—Bulletin 700 contains some 40 pp of descriptive, application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

297 V-Belt Drive Design Book—Providing 54 pp of engineering data on manufacturer's Bull Dog belts, this catalog gives general drive information as well as simplified methods of selecting V-belt drives, V-flat drives and several types of non-standard drives. Includes selection tables, prices. Boston Woven Hose & Rubber Co.

298 Manual on Power Transmission Machinery—Containing 225 pp of data, this illustrated handbook covers roller bearings, V-belt drives, friction clutches, couplings, collars, sleeve bearings, pulleys, take-ups and hangers. Provides engineering data, formulas. Dodge Mfg. Corp.

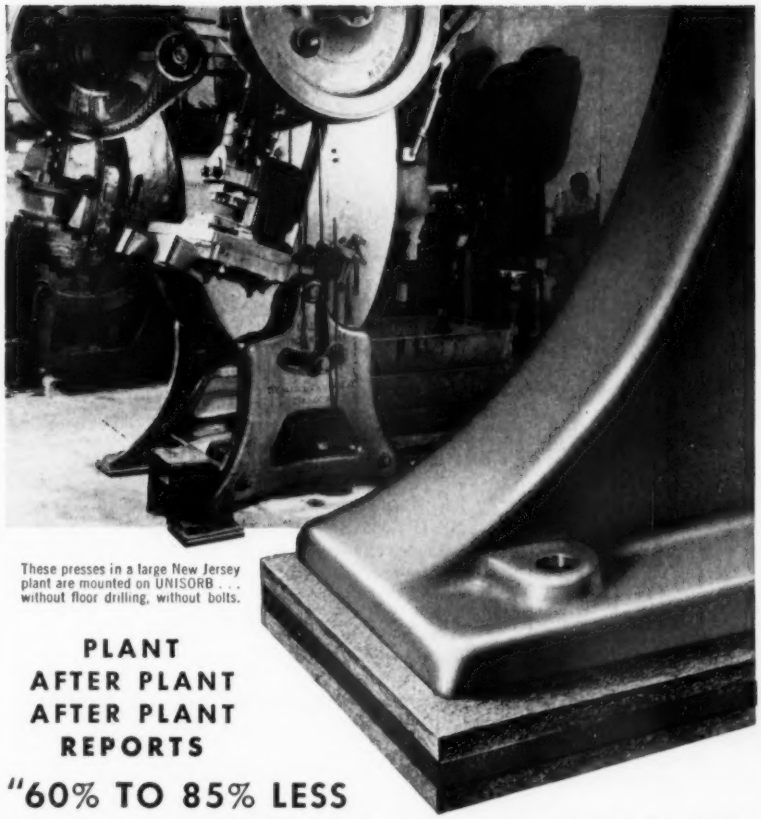
299 Oilless Bearings for Conveyors—Technical Catalog 210, 20 pp, gives detailed information for specifying, installing and use of bearings for screw and roller conveyors, together with operating characteristics. The sectionalized catalog provides tabular data and dimensional drawings to facilitate identification of bearings for replacement. Arguto Oilless Bearing Co.

300 Improved V-Belts—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

301 Power Drive Handbook—Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

302 Belts to Suit the Job—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission applications as well as special jobs. Imperial Belting Co.

303 Hydraulic Drive—The Hydro-Sheave, hydraulic power transmission unit, designed for immediate application to electric motors and internal combustion engines



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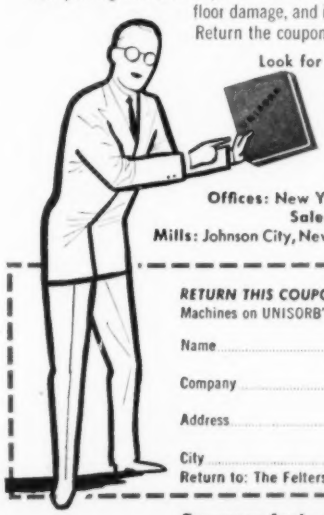

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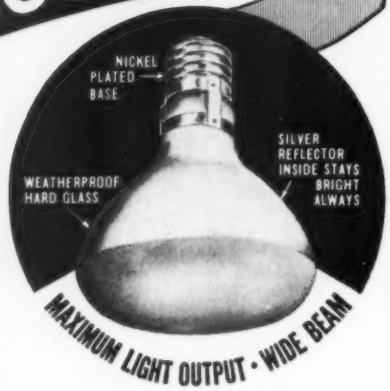
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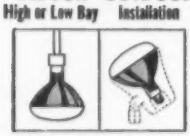

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DATA FILE

(Begins on page 199)

in ¾ to 40 hp range is described in illustrated Bulletin 145-B. Tells how unit offers operators of small power units a low cost conversion device as easily applied as a sheave. Twin Disc Clutch Co.

304 Chart on Belt Care—In the interest of conserving power transmission belting, this manufacturer offers a cardboard wall chart on the care and maintenance of power driven belts. Carries sketches and brief text covering the steps to be taken to select the right belt, install it, use it correctly and keep it in good operating condition. Cling-Surface Co.

305 Brakes and Brake Motors—Construction advantages of company's brakes are featured in illustrated Bulletin SL-610-1 on brakes and brake motors. Dimensions, mechanical and electrical characteristics. Crocker-Wheeler Div., Elliott Co.

MAINTENANCE

306 Building Maintenance — Handbook 7 offers 64 pp of information on floor surfacings, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

307 What to Do About Sashes—Problems and suggested methods for economical maintenance of steel and wood sash are outlined in "Trouble-Free Sash Maintenance." Subjects covered include importance of making buildings tight and draft-free, comparison of putty and mastic glazing for windows, value of caulking openings between sash and masonry, methods of painting. The Tremco Mfg. Co.

308 Roofing Manual — Engineering data on roofing is given in Specifications 50, 30 pp. Covers coal tar pitch roofings, waterproofings, insulations, flashings, protective coatings. Includes illustrated instructions. Tar Products Div., Koppers Co., Inc.

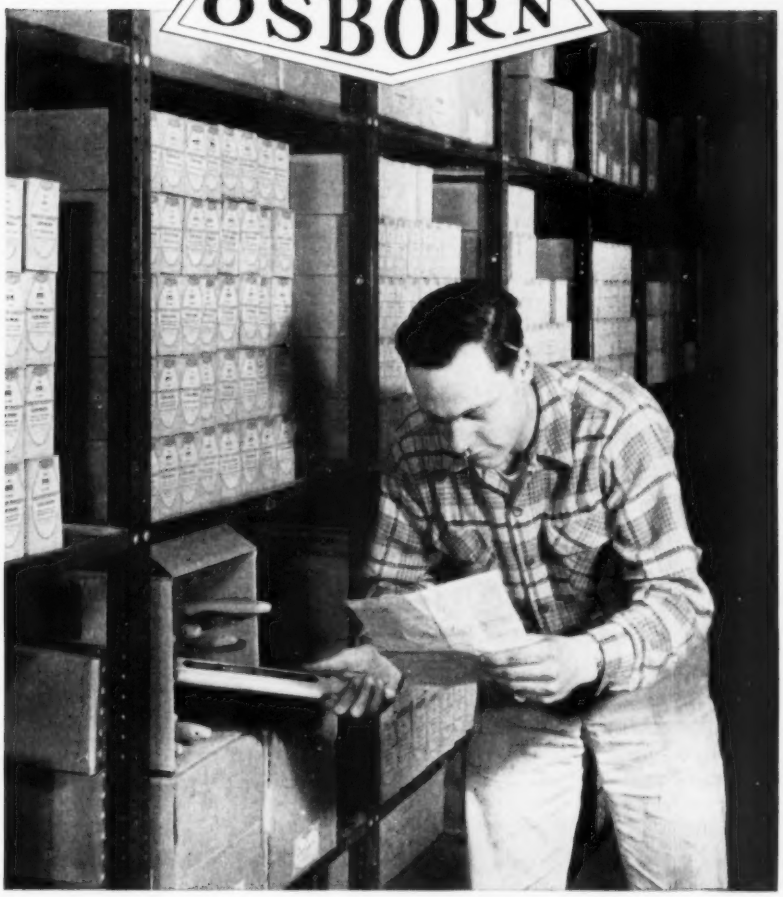
"Fenwick, you're fired! Pick up your gear and get out."

309 Basic Roofing Information — "What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also, roofing materials. Johns-Manville.

310 Iron Cement Handbook — This is a 40-pp pocket-size catalog of iron cements for repair, other uses. Tells how to mix and apply them. Gives illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

311 Maintenance Manual — "Over the Rough Spots" is a 48-pp pocket size booklet giving the answer to practically every repair or building maintenance problem. Tells how to patch holes and resurface floors, how to prevent water seepage in

OSBORN



FOR ALL YOUR NEEDS. There's an OSBORN brush for every industrial brushing need and your INDUSTRIAL DISTRIBUTOR . . . as handy as your phone . . . is ready to serve you promptly. Call him for paint brushes, maintenance brushes, power brushes.

EASY TO BUY. You can make one order cover OSBORN Brushes and other leading-brand industrial supplies when you buy from your INDUSTRIAL DISTRIBUTOR. This automatic procedure streamlines your purchasing, cuts red tape and gives you nationally accepted, known-quality brands.

This is YOUR warehouse ...saves you floor space

Your Industrial Distributor carries a large stock of OSBORN Brushes to supply you with the right type of brush quickly. You can reduce your inventory . . . save floor space and save on the hidden costs of maintaining stock records by ordering your maintenance brushes, paint brushes and power brushes from this trusted source.

Group your brush orders with those of other industrial supplies and save valuable purchasing time. Specify OSBORN and you are *sure* to get the best in quality . . . backed by more than 60 years' service to Industry! *The Osborn Manufacturing Company, Dept. T-1, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

BUILT FOR INDUSTRY. You can buy OSBORN brushes with confidence because their workmanship and materials are backed by 60 years of OSBORN service to Industry. Here, the OSBORN Master* Sweep Floor Brush gets the job done fast.

*Trademark

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

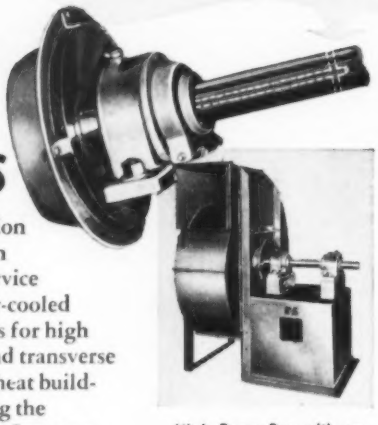
For more facts circle 647 on Reply Card

Bayley

Service That ENDURES Is Assured By Quality Features Like This . . .

AIR-COOLED Shafts For HIGH TEMP FANS

Typical of the minute attention to small details that results in long-lasting, trouble-free service are the specially designed air-cooled shafts used in BAYLEY Fans for high temperatures. Lengthwise and transverse passages in the shaft reduce heat build-up in the bearing, minimizing the possibility of shaft failure . . . Just one of many reasons for specifying "BAYLEY."



High Temp Fan with enlarged view of shaft cooling fan and air passages.

Write for BAYLEY Bulletin 41-EX

Bayley BLOWER COMPANY
Engineered Air-Handling Equipment

1825 W. Burnham St. • Milwaukee 14, Wis.

For more facts circle 648 on Reply Card

DATA FILE

(Begins on page 199)

underground foundations, repair leaky roofs, preserve concrete or wood surfaces, protect structural steel from rusting, and gives many time and labor saving methods. Generously illustrated. Stonhard Co.

312 Floor Maintenance Buyers' Guide—Brief, but practical application details on floor machines and accessories and a wide range of floor cleansers, waxes and other preparations are presented in this illustrated bulletin. Finnell System, Inc.

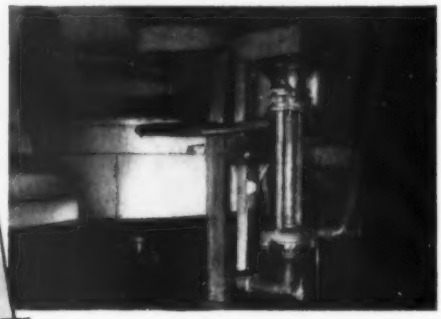
313 Proper Care of Floors—Filled with what-to-use and how-to-use-it information, this 32-pp booklet is a well-written, practical text on floors. Presents floor preservation as a triple process involving cleaning, sealing and maintaining. Discusses various floor surfaces and their special problems. Gives helpful hints on floor maintenance and provides a handy chart covering preparation procedures and products for 12 common floor surfaces including cement, cork, tile, linoleum, mastic wood. West Disinfecting Co.

314 Vacuum of Many Jobs—Bulletin 144, 20 pp, describes and illustrates 132 unusual industrial uses for company's vacuum system. The Spencer Turbine Co.

315 Floor Scarifier—Bulletin 83.4 describes and pictures a new hydraulically equipped machine designed for removal of traffic-packed grimes from trucking aisles in industrial plants. Explains how it cuts, picks up grime in one operation; is one-man operated. G. H. Tennant Co.

316 Tar Base Coatings—Now available is a collection of five bulletins on company's 100 series of cold applied tar base coatings. One bulletin gives general information on the full line and provides an application

This NEW *Nagle* "TV" PUMP is NO "WALLFLOWER"



IT'S prim and clean, and designed to mount on wall or side of a tank or sump, but it's no "wallflower." You'll find it in the thick of things! A single stage, bottom entrance, vertical shaft, dry pit pump for handling abrasive mixtures and corrosive liquids and slurries — pumps anything that will flow. The Nagle type "TV" gives you:

- Freedom from leakage—clean floors assured
- No stuffing box
- No submerged bearing
- Sizes from ¾" to 10"
- Capacities to 4,000 g.p.m.

NAGLE PUMPS

NAGLE PUMPS, INC.
1261 CENTER AVE., CHICAGO HEIGHTS, ILL.

PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

For more fact circle 649 on Reply Card

ARMSTRONG BROS.
Better PIPE TOOLS

Reversible Ratchet STOCKS and Adjustable DIES

Exceptionally convenient where space is limited, this stock simplifies pipe threading close to walls, in corners and whenever operating room is restricted. With *adjustable* dies (cut exact, over or under size threads) it is an ideal tool where valves and fittings are being installed or maintained.

"ARMSTRONG BROS." Adjustable dies are of special Vanadium Tool Steel, have "backed-off" teeth, correct cutting angle, ample chip clearance and correct throat angle. They start and cut easily, hold their sharpness and "spin" off pipe without jamming or tearing threads.

Write for Catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5207 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

For more facts circle 650 on Reply Card

Saved → $16,000.00 in one year

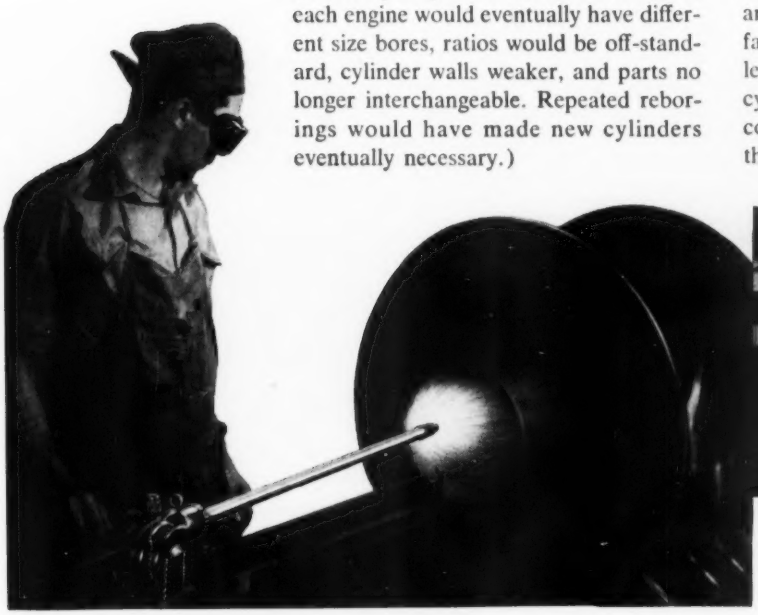
How one plant saved $16,000.00 in one year on one type of machine repair, with metallizing.

This large mid-West chemical plant uses fourteen gas engines, in compressor service, operating 24 hours a day. Fuel is a mixture of hydrogen, methane and air, with charcoal dust added to increase combustion efficiency.

Three methods of reconditioning these engines were available;

1. the cylinders could be replaced and standard sizes of other components preserved, at a cost of $450.00 per cylinder;
2. the cylinders could be rebored and fitted with oversized pistons and rings, at $400.00 per cylinder. (With this method, each engine would eventually have different size bores, ratios would be off-standard, cylinder walls weaker, and parts no longer interchangeable. Repeated reborings would have made new cylinders eventually necessary.)
3. Metallizing, at $125 to $150 a cylinder.

Cylinders are bored, threaded, grit-blasted, degreased and sprayed with Metcoloy #2 Stainless Steel, 20 to 30 pounds being applied. Cylinders are then finish-machined and honed to size. In the first year 64 cylinders were re-surfaced at a total saving of about $16,000.00, over the unsatisfactory method of reboring and fitting with oversized rings and pistons—$19,200.00 over the cost of new cylinders. Past experience with the greater particle hardness of sprayed metal, its better lubrication characteristics and the superiority of the stainless steel surface over the original cast steel cylinders leads this user to estimate that the rebuilt cylinders are good for another 15 years of continuous operation, about 50% more than the original life before reconditioning.



ABOVE: Gas engine—cylinders reconditioned with metallizing.

LEFT: Gas engine cylinder—being metallized while rotating in improvised jig set-up.

See other examples of metallizing illustrated in our 8-page Bulletin in your Sweet's Plant Engineering File—Section 7a/Me.

Just One Example. This is just one among many money-saving applications of metallizing in this plant. Almost any rotating or sliding machine part subject to wear, can be reconditioned with this modern repair process. Parts are kept to standard sizes, replacement stocks can be cut, and production "downtime" caused by delivery delays or shortages of new parts is eliminated.

Further Information. Send off the coupon for a call by a factory-trained Metco Field Engineer, or a copy of Bulletin 54, *"Metallizing Saves Money"*.

The following trade names are the property of Metallizing Engineering Co., Inc., Metco, Metcoloy *Reg. U.S. Pat. Off.*

METALLIZING ENGINEERING CO., INC.
38-14 30th Street — METCO METCO — LONG ISLAND CITY 1, N. Y.
In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD., Chobham near Woking, England

Don P. Watson
METALLIZING ENGINEERING CO., INC.
38-14 30th Street
Long Island City 1, N. Y.

☐ Please have Metco Field Engineer call.

☐ Please send me, without obligation, "METALLIZING SAVES MONEY".

NAME_____

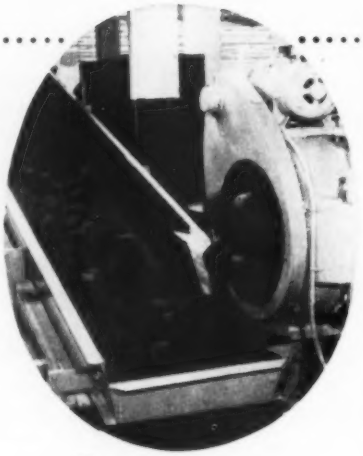
COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

For more facts circle 651 on Reply Card

300° rubber rides on job-designed belting at Western Electric



■ No, those aren't coconuts you see on the conveyor. They are chunks of synthetic rubber—used for insulating telephone drop wire—in the Western Electric Company's Point Breeze Works at Baltimore. They emerge from the strainer (right) at temperatures up to 300° F. and are transported to the rubber mill for final processing. The 30" Imperial Hot Stock Belt is 50 feet long, handles a maximum load of 700 pounds, and has been in service nearly four years.

Imperial Belts cost less to use

Like all Imperial Belts, this one was job-designed for the exact service in which it was to be used. Imperial Hot Stock is expressly made for hot stock operations where water is not present, and has proven its value repeatedly in large rubber plants where it conveys extruded rubber at high temperatures.

Whether you are handling rubber or red hot sand . . . grain or metal or boxes . . . there is an Imperial Belt that will do your particular job at lowest cost. Write for catalog and prices.

Imperial BELTING CO.
1759 S. Kilbourn Avenue
Chicago 23, Illinois

ENGINEERED BELTING—THE RIGHT BELT FOR EACH JOB
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WISSCO

METAL PROCESSING BELTS

for every industrial processing need

Fabricated in steel or stainless steel in various weaves and constructions to operate efficiently and dependably from sub-zero temperatures up to 2100° F. Try us on your next order.

Write to 56 Sterling Street, Clinton, Massachusetts.

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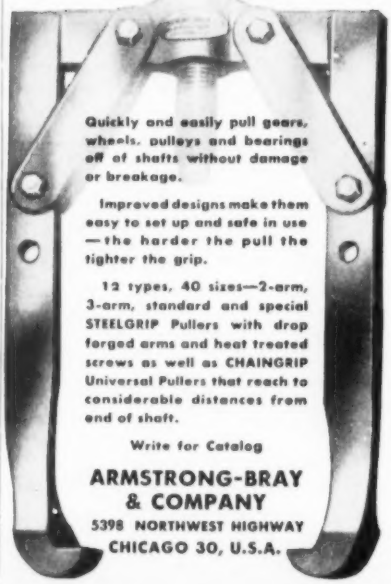
WISSCO BELTS
PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

For more facts circle 653 on Reply Card

ARMSTRONG-BRAY
GEAR and WHEEL PULLERS



Quickly and easily pull gears, wheels, pulleys and bearings off of shafts without damage or breakage.

Improved designs make them easy to set up and safe in use—the harder the pull the tighter the grip.

12 types, 40 sizes—2-arm, 3-arm, standard and special STEELGRIP Pullers with drop forged arms and heat treated screws as well as CHAINGRIP Universal Pullers that reach to considerable distances from end of shaft.

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ARMSTRONG-BRAY & COMPANY
5398 NORTHWEST HIGHWAY
CHICAGO 30, U.S.A.

For more facts circle 654 on Reply Card

DATA FILE

(Begins on page 199)

chart. The others give detailed specifications and application information on the various types. These include a coating for protection against severest corrosive conditions; a thin high gloss coating for general maintenance purposes; a coating for protection against generally severe corrosive conditions; and a coating for water tank interiors. Pittsburgh Coke & Chemical Co.

CONSTRUCTION

317 Industrial Steel Windows — Planned to offer comprehensive easy-to-find data, this 24-pp catalog gives descriptions, specifications, sizes, uses and advantages of Fenestra pivoted windows, commercial projected windows, and security windows used separately and in combination, also continuous windows used mainly for top-lighting in monitor and sawtooth roof construction. Detroit Steel Products Co.

318 Technical Manual on Plywood — Available basic data on Douglas fir plywood, its properties and use, are offered in looseleaf sections with firm binder. Presents engineering information about this panel material and its performance in varying applications. Covers commercial standards, designing with plywood, prevention of condensation, lateral bearing strength of nailed plywood joints, deflection. Please give your title when requesting this book. Douglas Fir Plywood Assn.

You may use the two Reader Service Cards to request information on ads, too. Just circle the key number appearing at bottom of ad.

319 How to Glaze with Plexiglas — Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this plastic sheet. Plastic Dept., Rohm & Haas Co.

320 Heat Absorbing Glass—This 16-pp catalog describes Coolite, a glass designed to trap and absorb much of the sun's heat and to filter out annoying glare. Discusses types and thicknesses, gives light transmission data. Pictures many industrial installations and shows how conditioned natural illumination helps reduce operating and maintenance costs. Mississippi Glass Co.

321 Aluminum Building Sheet — Stressing advantages of aluminum for siding and roofing, 12-pp Form AD-247 presents both dimensional data and engineering details covering its use. Provides illustrated suggestions for use of fasteners, flashing details, directions for applying the sheet. Includes tips on painting, welding, storing. Aluminum Co. of America.

322 Glass Block Fenestration—The natural ventilation characteristics of glass block fenestration are presented in this illustrated report of a test project. In some 88 pages, report covers sun hoods, window types, dual outlets, air speeds, double loaded variations, reverse draft and ventilation below window sill. Test data is summarized and recommendations included. Although test was conducted on glass block fenestration in school buildings, the information will be of interest to those concerned with industrial applications of glass block. Kimble Glass Co.

323 Flooring Guide—Plant engineers interested in specifying resilient tile flooring will find valuable information in Form 107. Tells what each type of resilient tile

DATA FILE

(Begins on page 199)

is recommended, and not recommended for. Specific information is given for asphalt tile, cork tile, rubber and grease-proof tiles. Kentile, Inc.

324 Non-Slip Flooring—Aigrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet A-5, 8 pp. Discusses safety features; gives fabricating data, sizes, allowable loads. Pictures some applications. Alan Wood Steel Co.

325 How Hardboards Improve Methods—Twelve-pp Form 5202, on production economies in plant maintenance, materials handling and processing, enumerates applications and specifies types and thicknesses of company's Presdwood for specific purposes. Lists 28 advantages of Presdwood, describes its use in architectural applications, bins, utility boards, cabinetwork, containers, booths and ventilators, work surfaces. Masonite Corp.

326 Metal Framing Guide — Although pocket-sized, 80-pp Catalog 800 is packed with illustrated information on an all-purpose metal framing system, and serves as a handy reference text. Fully indexed, shows the versatile basic channel, suggests possible combinations and pictures typical fittings and parts. Provides design and application data and pictures some of the almost unlimited uses for this framing system. Includes reference tables. Available to qualified plant engineers. Unistrut Products Co.

TOOLS, WELDING

327 Idea Book — Sixty pages of "1001 Shortcuts" for production, construction and maintenance make this hand-tool and hydraulic-tool handbook one of the most useful ever. Large photos and concise descriptions give ideas developed and successfully applied by hundreds of tool users. One of the big values attached to the "Idea Book" comes from the manner in which it stimulates the user to create his own ideas. Typical job photos suggest the general principles of the applications. Blackhawk Mfg. Co.

"I do believe we could speed up production a bit, miss, if you'd tighten the screws with a screwdriver, and not your fingernails!"

328 Pipe Tool Ordering Guide—Catalog 2-51, 8-pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives sizes, prices. Armstrong Bros. Tool Co.

329 Portable Spray Gun—An easily used and inexpensive spray gun pressurized with a CO_2 cartridge is featured in this single sheet bulletin. Sketches show the gun in use for painting, cleaning, other work. Sullivan-Becker Machine Co.

XACTO... THE METER THAT'S CHANGING LIQUID HANDLING HABITS

In industry after industry XACTO meters have proved the most effective way to measure liquids . . . accurately and dependably. XACTO safely handles 662 different liquids in processing, blending, packaging and many other operations . . . in batching or continuous operation.

BOWSER

There's no substitute for XACTO . . . write today for the facts on Bowser cost-saving meters!

BOWSER, INC., 1343 CREIGHTON AVE., FORT WAYNE 2, IND.

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Seals Your BEARINGS Against Grit

Due to its tough tallow base, Albany Grease forms a ring at the end of a bearing which helps prevent entry of dust and grit to the bearing itself.

Albany Grease comes in three densities: No. 1, No. 3, No. XXX. It is adapted for use with grease cups or open bearings, operating at temperatures up to 200 deg F.

Tips for proper lubrication of equipment used in steel mills, mines, foundries, textile mills, power plants, paper mills, etc., will be found in Albany Recommendation Chart. See it at your Mill Supply house; or write for free copy.

ADAM COOK'S SONS, INC.
LINDEN, NEW JERSEY

ALBANY GREASE
•
ALBANY BEARING LUBRICANT (Ball and Roller)
•
ALBANY GEAR LUBRICANT
•
ALBANY PRESSUREGREASE UNIVERSAL
•
ALBANY PENETRATING OILS
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FREE: Send for copy of Albany Recommendation Chart.

Albany Lubrication Products

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As more and more products reach a stock situation, the need for direct, aggressive selling and advertising becomes more important. It was a practical approach during the '40's to spread your institutional advertising message to a wide range of functional people, regardless of their direct buying influence. That day is gone . . . today you must reach your most influential buyers the fastest and most economical way possible.

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You can reach the most important plant operating men today . . . the Plant Engineers . . . by "Pin Pointing" your advertising in PLANT ENGINEERING, the only magazine edited exclusively for the Plant Engineering function. It selects, by the "Pin Point" process, the key buyer in all important plants in the Country.

"Pin Point" Selection Develops a sound functional group of readers. PLANT ENGINEERING goes further than plant lists to provide a live penetrating audience.

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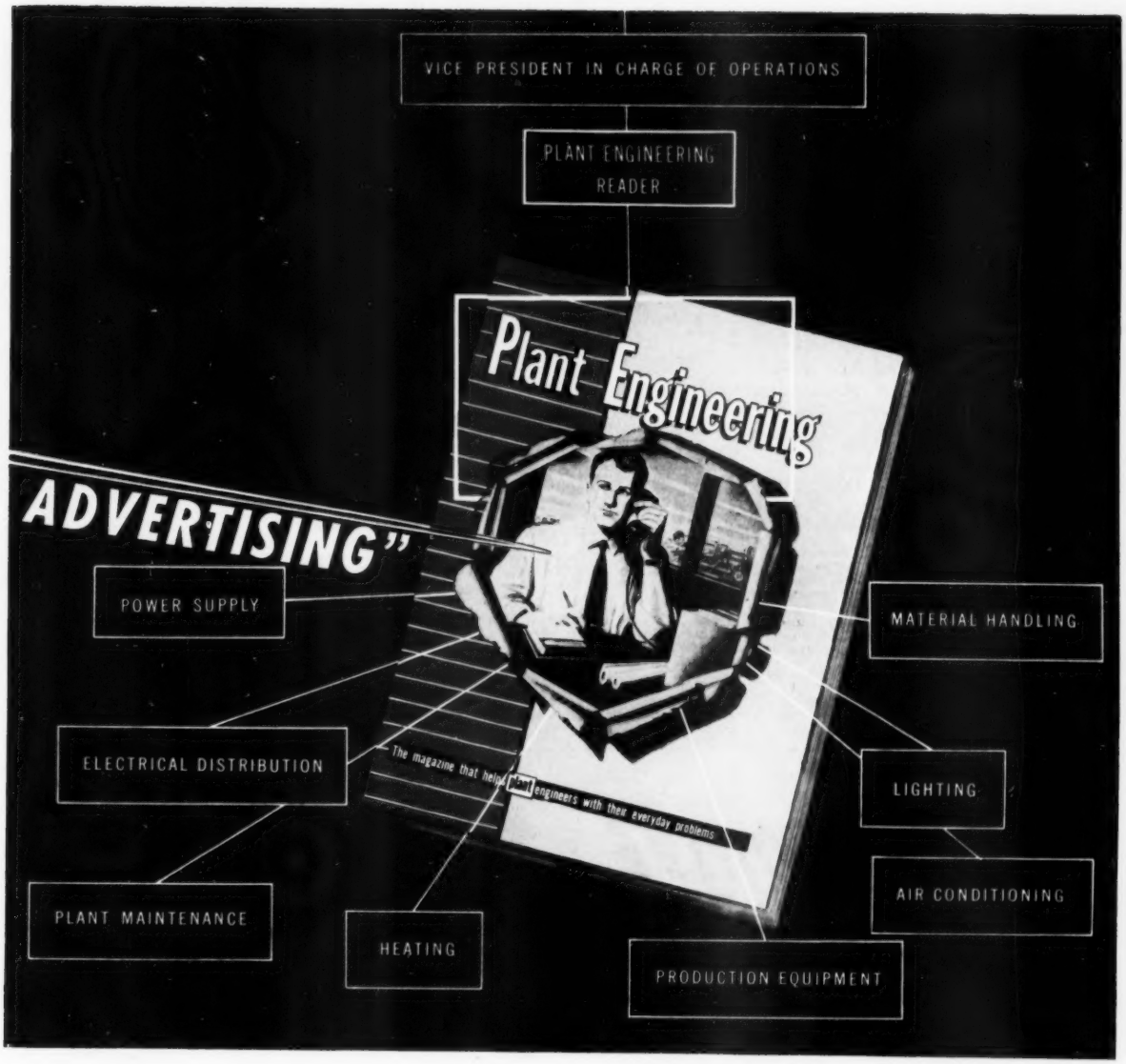
This is your assurance that when you advertise in PLANT ENGINEERING you are "Pin Pointing" your sales message to a select group of Plant Engineering men. Therefore, you buy *only* the functional coverage you need.



here are five outstanding reasons for placing PLANT ENGINEERING on your advertising schedule—

1. **Reaches 34,219 plant engineering men . . . *more plant engineers than any other industry trade paper.***
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REMEMBER **. . . Sell the Plant Engineer and you've sold your product.**

For more detailed facts . . . call on our District Manager for PLANT ENGINEERING'S "Comparison Test." Technical Publishing Company, 110 South Dearborn St., Chicago 3, Ill.

DATA FILE

(Begins on page 199)

330 Metal Spraying Gun — Company's Type 4E gun for high-speed spraying with all metals is described in Bulletin 94. A cutaway drawing shows construction features of the gun which is designed for tool-post mounting or hand operation. Metallizing Engineering Co., Inc.

331 For Faster Fastening — Form 35-A explains and illustrates company's system of fastening tools and fasteners for use with steel, wood, concrete, fabricated hard materials. Ramset Fastening System, Inc.

332 Stud Driver—Special operating features of company's Model 450, a self-powered quick fastening tool, are detailed in Form 937A. Photos show how the driver is used and picture it in action. Industrial Tool Div., Remington Arms Co., Inc.

333 Socket Wrenches—Sixteen-pp Catalog 460 presents a line of socket wrenches in sizes from ¼ to ¾ in. square drive, also socket wrench sets, heavy duty sockets and open end wrenches. Illustrated, gives sizes weights and packaging information. Fairmount Tool & Forging, Inc.

MATERIALS HANDLING

334 Data on Tramrail Equipment — Twelve-pp Form 2008F is a well organized booklet on tramrail systems. Tells what an installation can do toward improving handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

335 Handbook on Overhead Conveying Systems — Manual A-56 provides 200 pp of information on overhead track systems and conveying equipment. Pictures installations, construction details; gives engineering data. Richards-Wilcox Mfg. Co.

336 For Overhead Handling—This 12-pp illustrated catalog covers motorized and hand operated cranes and monorails engineered for efficient, low-cost handling. Special construction features are detailed; accessory equipment shown. Abell-Howe Co.

337 Engineered Monorail Applications—A file of application literature is announced as the beginning of a new service offered potential users of monorail equipment. Includes a technical booklet on automatic dispatch systems and an equipment bulletin in addition to several case studies of installations. As they are completed new groups of case studies will be sent to holders of file. Available to qualified plant engineers. The American MonoRail Co.

338 Metal Conveyor Belts — This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belt; covers raised edge and flight constructions, chain edge constructions, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

339 Cost-Cutting Conveyor Units—Standardized gravity and power units covering a wide range of conveying jobs are described and pictured in Bulletin 63-C, 30 pp. Roller, wheel, and belt conveyors, elevating units, drives and accessories are presented, along with specifications. Practical in its approach, this book offers ideas for the use of these units. Standard Conveyor Co.

340 Tubular Conveyors — Form HC-541 contains about 44 pp of data on tubular conveyors for moving almost any flowable material. Shows basic types of these conveyors, tells what they're designed to do and how they are applied. Lists materials being handled to advantage with them, and discusses benefits. Gives engineering data. Hapman Conveyors, Inc.

341 Belt Conveyors — Virtually a handbook on belt conveyors, 90-pp Catalog 852 presents information on the latest designs of conveyor details and engineering data necessary to plan a belt conveyor for any application. In addition to specifications on company's standard belt conveyor units, gives data on anti-friction idlers and other equipment necessary in the application of belt conveyors—belting, trippers, pulleys, take-ups, backstops. The Jeffrey Mfg. Co.

342 Fastenings for Conveyor Belts—This collection of data covers hinged fastenings, repair plates, lacings, hooks, round belt couplings, also lacers, cutters. Gives instructions for use. Armstrong-Bray & Co.

343 Belt Conveyor Idlers—Bulletin 51-81, 42-pp, on belt conveyor idlers and machinery, includes engineering information helpful in designing and specifying belt idler equipment and cross-section drawings of both steel and cast gray iron idler rolls. Data on a return belt training (self aligning) idler is given, together with material on steep-angle troughed belt idlers and troughed belt self-aligning idlers. Information on lubrication material provided. Chain Belt Co.

344 How to Pick a Truck—Catalog 54, 8 pp, features a step-by-step procedure for making the best fork truck choice for a particular handling job. Other sections in the booklet show at a glance complete specifications on each of company's trucks, and illustrate important construction and design features. The Baker-Raulang Co.

345 Trucks, Casters, Wheels — Catalog 50, 65 pp, covers platform trucks, superstructures, two-wheel and pry trucks, dollies, trailers, casters, wheels, offering a wide range of chassis, superstructure and wheel combinations. Thomas Truck & Caster Co.

346 Data on Truck Casters — As much specific information as can be presented in

U.S. VARIDRIVE ...the miracle motor

ANY RPM
by simple dial control

Increase machine output, improve operator's ability, upgrade quality of work. Write for descriptive Bulletin.

U. S. ELECTRICAL MOTORS Inc.
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CONSECO FLOWRITES

Low Cost Protection for
HEAT EXCHANGER TUBE ENDS

In the past 31 years Conseco has provided millions of Flowrites for tube inlets of heat exchangers operating in all industries and all applications. Tube inlets become eroded and worn long before the remainder of the tube, and by reinforcing the inlets it is possible to increase the effective tube life many times.

Flowrites—made of the same metal as the tubes—are available in any length, diameter or gauge. They are easy to install and remove by unskilled help. When Flowrites themselves become worn (*instead* of the tubes!), just pull them out and install new, longer Flowrites.

Get the facts from the 8-page Flowrite "proof" booklet, available upon request.

CONDENSER SERVICE & ENGINEERING CO.
75 RIVER ST., HOBOKEN, N. J.

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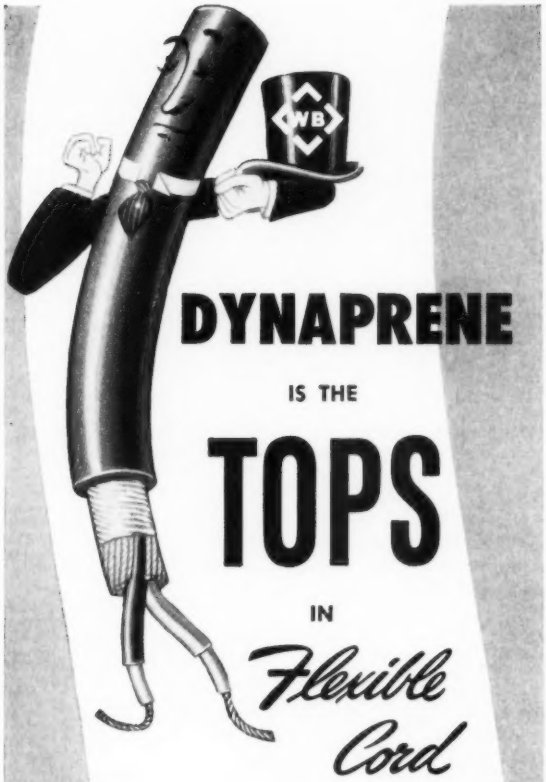

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IS THE

TOPS

IN

Flexible Cord

DYNAPRENE is superior in performance because it is superior in quality. Jacketed with a special neoprene compound that provides exceptional resistance to abrasion; vulcanized by the continuous steam cure process that assures accurate centering, even cure with no flat spots and consequent uniformity of jacket thickness, the superiority of **DYNAPRENE** is understandable.

Add to these advantages greater flexibility, high tensile strength and the fact that the neoprene jacket is flame retardant and it adds up to additional superiority.

Superior too, is **DYNAPRENE'S** resistance to the harmful effects of oil, grease, sunlight and most acids.

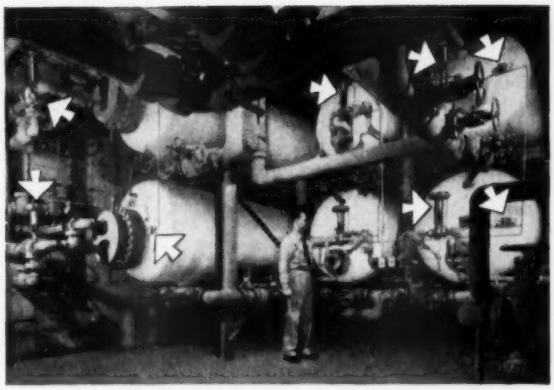
DYNAPRENE exceeds Underwriters' requirements for SO, SJO and SV-neoprene jacketed cordage. Be sure to specify Whitney Blake **Dynaprene** for your flexible cord requirements.

WELL BUILT WIRES SINCE 1899

WHITNEY BLAKE CO.

NEW HAVEN 14, CONNECTICUT

For more facts circle 659 on Reply Card



Water Heaters Controlled by Powers Accritem Regulators

What's Your Water Temperature Control Problem?

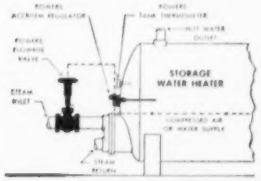
POWERS ... with their many types of thermostatic regulators and 60 years experience is well qualified to help you find the right type of control for these applications:

Forced Hot Water Heating Systems; various types of Water Heaters and Heat Exchangers; Jacket Water Cooling for Air Compressors, Diesel and Gas Engines also Cyclotrons, Chocolate Enrobers and Plastic forming Presses; all types of Shower Baths and Hospital Hydrotherapy; processing X-Ray, Regular and Colored Film — and hundreds of other uses.

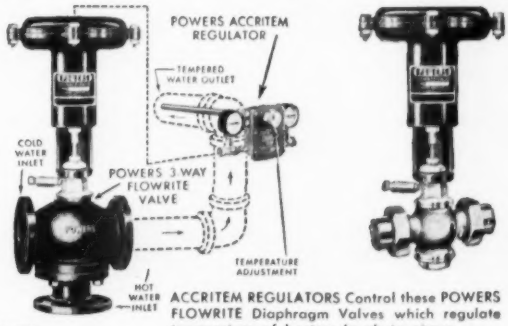
Only one of Powers varied line of water temperature controls is shown here ... the *Accritem Regulator*. It's compressed air operated, has calibrated dial temperature adjustment, adjustable sensitivity and many other features described in *Condensed Catalog 3035*.

Compressed Air Operated

Only one of many applications Small Size. Bulb is 12" long



Powers Accritem Regulators Give Years Of Dependable Service



ACCRITEM REGULATORS Control these POWERS FLOWRITE Diaphragm Valves which regulate temperature of heaters in photo above.

(a92)

THE POWERS REGULATOR COMPANY

Skokie, Ill. • Offices in Over 50 Cities, see your phone book.

OVER 60 YEARS OF WATER TEMPERATURE CONTROL

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DATA FILE

(Begins on page 199)

a catalog for commercial usage is included in 105-pp Catalog 124 on truck casters. Besides specifications, ordering data and photos, this well-indexed book includes load capacity charts, defines caster terminology, tells how to select casters and install them. The Bassick Co.

347 Industrial Truck Reference Guide—Bulletin 300, 44 pp, covers company's line of current model tractors, trailers, fork lift trucks, platform lift trucks and load-carrying trucks. Major categories are: the trackless-train system; the fork-truck pallet system; and the lift truck-skid system. Each category is preceded by an analysis of applications and merits of the handling system. Mercury Mfg. Co.

348 Shovel and Loader — Described in 12 pp Bulletin 1032 is a hydraulic crown and hoist shovel and loader incorporating mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

349 Materials Handling Equipment — Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. The Yale & Towne Mfg. Co.

350 Industrial Logistics — Form A-9516-4450 is a 12-pp booklet covering strategic handling of materials from raw state to distribution. Discusses master unit load and transportation cycle. Explains company's system of adapting all loads to four types of containers, assembling maximum numbers of these into master unit loads, and transporting them as single units. The Elwell-Parker Electric Co.

351 Stand-Up Fork Lifts—Complete specifications are available on stand-up fork lift trucks in 2000- and 3500-lb capacities. These trucks feature easy maneuverability and manufacturer's Lev-R-Matic drive. Mobilift Corp.

352 All-Purpose Lifts—"Let Big Joe Do It" is a bulletin on hydraulic lifting units. Features a heavy duty model for lifting loads to 52 in. height. Big Joe Mfg. Co.

353 Electric Hoist Manual—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

"That guy from the machine shop goes to a lot of trouble just to remind us he makes more money than we do."

354 Industrial Lifts—This booklet presents a wide range of elevating equipment designed to step up efficiency and cut handling costs. Covers dock lifts, crossover bridges, sidewalk elevators, truck service lifts. The Wayne Pump Co.

355 Trolley Hoists — Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity army-type trolley hoists, plain or geared, for use where a close headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

356 Chain Hoists — Catalog 61, 32 pp, covers a line of chain hoists, telling how to select and use them. Provides an illustrated comparison chart of hoist types, a selector table and discussion of factors to be considered in buying a hoist. Multiple gear chain hoists, screw gear chain hoists, differential chain hoists described separately. Reading Crane & Hoist Corp.

357 Portable Hoists—This bulletin describes a lightweight air hoist in 2000, 1000, 500 and 300-lb capacities. Gives specifications, dimensions. Keller Tool Co.

358 Manual on Electric Hoists—Catalog H-46, 44 pp, covers monorail and stationary hoists and car pullers. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspensions, controls. American Engineering Co.

359 For Hopper Economy—"In Dollars and Sense" explains long run economy of company's self-dumping hoppers, showing how they operate and telling how they fit particular plant requirements. Illustrated with photos, gives dimensions, weight of a standard 1 yd model. Roura Iron Works.

FUEL OILS, LUBRICATION

360 Versatile Industrial Oil — Described in 20-pp Form AD 4078 is an all-purpose oil offering protection for a wide range of

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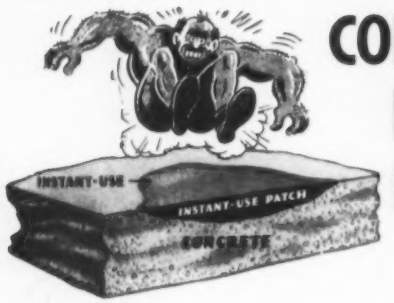

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Repair broken factory floors without the usual traffic tie-up. Simply shovel INSTANT-USE into hole or rut — tamp smooth — truck over! No waiting! INSTANT-USE bonds tight to old concrete — right up to a feather edge. It's tough. Wears like iron. Won't crack or crumble. Install complete overlay where floors are badly chewed up. Used indoors or out. Immediate shipment.

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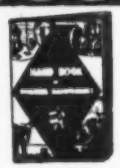

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Group of RUEMELIN Fume Collectors Keeps Shop Clear of Welding Fumes

This well ventilated welding department is typical of hundreds of similar installations. Welding operators appreciate smoke and gas-free atmosphere. Thousands in service. Many repeat orders. Collecting fumes at the source with local exhaust hoods has proven most practical in operation. It is particularly helpful in winter months when doors and windows are closed. Write for Bulletin 37-D describing all types of Ruemelin Fume Collectors.

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INSTALL VIKING
Fuel and Lube Oil Pumps

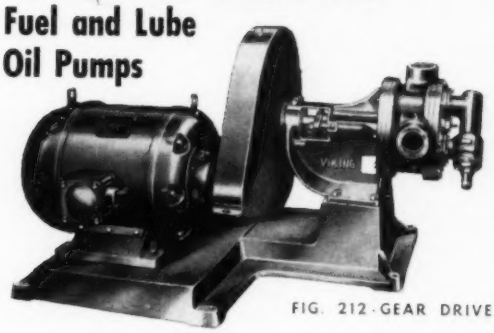

FIG. 212 GEAR DRIVE

The use of Viking Rotary Pumps by many of the leaders in the industrial fields is your assurance of dependable, efficient pumping.

FOR THE JOB REQUIRING:

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See Our Catalog in SWEETS

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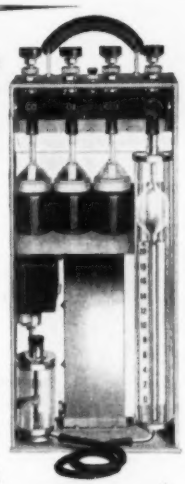

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SINCE 1896

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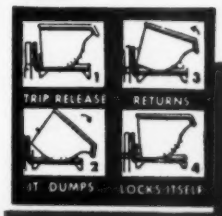
Reduce FATIGUE
Use Self-Dumping Containers
Step Up PRODUCTION



Save 50% Labor-Time with
ROURA Self-Dumping HOPPERS

Imitated by Many—
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Only ROURA Has The Exclusive PATENTED Instant Release Handle

Handling wet or dry, hot or cold, bulky materials quickly and easily, the ROURA is simple to operate—only one man is required for distributing and unloading—and he does this in much less time than ordinarily required under old-fashioned manual methods. Thousands of Roura Hoppers (which fit any standard fork or platform lift truck) are in constant daily operation, serving and saving for such firms as Owens-Illinois Glass, Corning Glass, National Fireproofing, General Motors, Ford, Chrysler, American Brake Shoe, General Electric, Westinghouse, Western Electric, American Steel Foundries, International Harvester, John Deere, etc.

By a simple lift of the exclusive release handle, the ROURA HOPPER dumps, rights and locks itself securely. Sizes—½, ¾, 1, 1½ and 2 cubic yards; the ROURA HOPPER can also be designed for flat trucks and in other sizes to meet specifications. Also, it can be equipped with special flanges that permit stacking to desired tiers for storage or future distribution of materials—conserving valuable floor space. Priced below all competition, the ROURA will quickly pay for itself many times over.

—Can Be Coated With Acid-Resistant Paints

Write today for detailed brochure, "In Dollars & Sense."

ROURA IRON WORKS, Inc.

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DATA FILE

(Begins on page 199)

industrial equipment, and available in 15 viscosity grades. Discusses six major characteristics of the oil; explains and pictures its use in hydraulic systems, speed reducers, air compressors, electric motors, hydraulic turbines, bearing systems, etc. A chart shows grades and uses, physical properties. Standard Oil Co. (Ind.)

361 Multi-Purpose Grease—This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Tells how it resists leakage, protects against rust and corrosion. Socony-Vacuum Oil Co.

362 Lubricant Data Book—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricants requirements of equipment in 25 major industries. Lubriplate Div., Fiske Bros. Refining Co.

363 Diesels, Their Fuels and Lubricants—This 46-pp book gives practical information on diesel engines, covering their history and economics as well as design characteristics and operating principles. Classification of diesels according to their speed is explained in this informative booklet. Sinclair Refining Co.

364 Cooperative Technical Consultation Service—This 24-pp booklet presents company's periodic consultation service offered to industrial plants and aimed at efficient use of petroleum products. Covers services available in solution of lubrication problems, metalworking operations, processing, fuel and heating oils, dust control. Gulf Oil Corp., Gulf Refining Co.

INSULATION

365 Heat Insulation—This 8-pp booklet on hydrous calcium silicate insulation is illustrated with graphs, tables and drawings showing numerous ways this insulation is used in industrial and commercial projects for temperatures up to 1200 F. Kaylo Div., Owens-Illinois Glass Co.

366 Pipe Insulation—Form 76-102 is a small folder stressing efficiency and economy of Amocel, a lightweight asbestos pipe insulation for temperatures to 650 F. Discusses its low thermal conductivity, high mechanical strength in relation to its weight. Union Asbestos & Rubber Co.

367 One-Coat Insulation—This 32-pp booklet describes company's Type D insulation, a sprayed-on coating for surfaces with temperature range from —40 to 390 F. Tells how one application of this coating not only insulates but also waterproofs, rustproofs, deadens sound, prevents condensation and resists fire. Tells how to apply. Insul-Mastic Corp. of America.

368 Insulating Wool—Bulletin WB-1 describes a low density, resilient insulating material with high thermal efficiency and sound absorption characteristics; it is made of fine glass fibers. Discusses lightweight, easy handling, fire and moisture resistance and other advantages. Gives thermal conductivity and acoustical performance data, sizes and thicknesses available. Glass Fibers Inc.

VIBRATION CONTROL

369 Engineered Vibration Control—Bulletin 104 presents spring, cork and rubber mountings, discussing advantages of each and use alone or in combination. Provides helpful selection chart covering a wide range of machines, showing recommended and alternate methods of isolation. The Korfund Co., Inc.

370 Simplified Isolation—A simplified method of machine isolation which utilizes pads and cement is described in this small folder. Explains how it reduces maintenance cost. The Felters Co.

SAFETY, SANITATION

371 Dry Chemical Extinguishers — New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb sizes are covered in Form C-104. C-O-TWO Fire Equipment Co.

372 Advice on Washrooms—Information on company's washroom advisory service is available to plant engineers. Tells of plans and specific suggestions for improving washrooms which are included in this service. Scott Paper Co.

OTHER EQUIPMENT

373 Rugged Refractories—Form 5120 is a 12-pp illustrated booklet explaining characteristics of several high quality refractories and telling what each is best suited for. Not an ordering book, covers silicon carbide types, electric furnace mullites, electrically fused alumina refractories and fused cast refractories, discussing their heat resistance, heat conductivity, chemical inertness, resistance to abrasion, spalling. The Carborundum Co.

374 The Circuit Rider Returns—Now available to plant engineers is the second printing of "The Circuit Rider." This 32-pp pocket-size manual presents a down-to-earth discussion, together with drawings, of basic designs in fluid power circuits and points out the wide range of operations possible through the application of different types of such circuits. The Logansport Machine Co. Inc.

375 Chemical Cleaning Service—Reduced maintenance costs and outage time are among advantages of company's chemical cleaning service for steam equipment and water lines discussed in this 8-pp bulletin. Before-and-after photos show some actual cleaning jobs. Dowell Inc.

IF THE AIR IN YOUR PLANT IS

all fouled up—

MUCKLE VENTS CAN HELP YOU

No problem too tough—whether your air is London Fog thick or Sahara Dry—gaseous or dusty- smoky or hot . . . MUCKLE VENTS remove it quickly and efficiently. These streamlined, propeller driven, roof mounted ventilators are designed with motor out of the air stream to effectively pull out either wet or dry air. MUCKLE VENTS are a completely weatherproof packaged unit ready to be installed with a minimum of expense and work, available in wide range of 15 sizes from 254 CFM to 10280 CFM.

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Tank Gauge

- FOR GAUGING LIQUIDS OF ALL KINDS
- 100% AUTOMATIC
- APPROVED BY UNDERWRITERS' LABORATORIES

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THE LIQUIDOMETER CORP.

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Conveys bags, cartons, boxes horizontally or at any decline and incline angle within its range. Easily wheeled about by one man — easy to adjust and use — fits in crowded aisles, cars and freight elevators. Handles packages up to 135 lbs. TWO SIZES: No. 11 Handibelt, 11 ft. long, piles to 7 ft. 6 in; No. 16, 15 ft. 9 in. long, piles to 10 ft. 6 in. Write for HANDI-BELT Bulletin — address Dept. PE-33.

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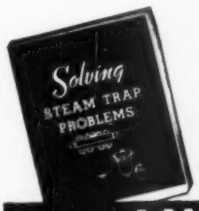
THE MAINTENANCE MANS' ENCYCLOPEDIA

When maintenance men have a steam trapping problem, they know they can find the answer in Anderson's booklet, "Solving Steam Trap Problems". This wonderful reference book contains valuable formulas, direct reading charts and helpful tables and graphs. It tells you how to simplify piping, cut down on the number of fittings and how to save on trap installation time. In addition, you will find condensation rate charts, graphs and tables. Save time and trouble—familiarize yourself with this invaluable book. Send the coupon for your free copy now.



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This book contains 36-pages of information you need to know about steam traps. Get your copy of this handy volume today.

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DATA FILE

(Begins on page 199)

376 Process Equipment—Twelve-pp General Catalog 12 covers dry blending, process and heat exchange equipment. Stresses company's twin-shell dry blender. Provides characteristics, application information, capacities, power requirements and other data for twin-shell, double-cone and ribbon blenders; kettles, evaporators, stills, agitators, autoclaves, pilot-plant units; heat exchangers. Patterson-Kelley Co., Inc.

377 Adhesives and Coatings—Up-to-date uses for adhesives, coatings and sealers are shown in this 8-pp booklet. Describes and pictures 25 industry-wide applications for the materials, including adhesives for holding plywood to metal, rubber to metal, and vinyl to wood; coatings for anti-corrosion protection, sealers for fuel tanks. Adhesive & Coatings Div. Minnesota Mining and Mfg. Co.

378 Power Brushes—Bulletin C-269, describing company's new power brushes, pictures their design. The Osborn Mfg. Co.

379 Self-Locking Nuts — Thin locknuts, 1/3 lower in height, designed to meet or exceed minimum Army-Navy tensile requirements for regular-height locknuts are featured in this new 26-pp catalog covering company's full line of locknuts. The thinner nuts can be used in many applications to save weight, space and assembly time. Sizes, fits, part numbers, dimensions are given. Standard Pressed Steel Co.

380 Steam Condensers — Bulletin 102, 24 pp, is a comprehensive presentation of manufacturer's steam condensers and includes photos of six typical installations as well as a section of engineering data, a discussion of air removal equipment and condenser maintenance. Condenser Service & Engineering Co., Inc.

381 Plumbing, Heating Supplies — Edition G is the current edition of this company's 118-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated, gives sizes, intended uses and necessary ordering information for items cataloged. J. A. Sexauer Mfg. Co., Inc.

382 Fundamentals of Hydraulics—Technical Bulletin B-4 is a 44-pp guidebook covering essential information on hydraulic systems, maintenance, trouble-shooting and selection of proper fluids. Besides offering well-organized reference data for plant engineers, this book is suggested as a training manual for maintenance personnel. It features phantom and cutaway drawings showing functions of basic types of valves, pumps, hydraulic motors, torque converters. Sun Oil Co.

383 Flexible Hose, Bellows — Catalog CMH-123, NPH, 16 pp, describes and gives specifications for manufacturer's line of Flexon bellows and flexible metal hose. Information on metallic bellows of stainless steel, brass, bronze and other alloys is included, covering bellows used in many types of control, regulators and thermostatic devices. A selection guide is provided for steam traps, valves. Flexonics Corp. (formerly Chicago Metal Hose Corp.)

384 Magnetic Pipeline Traps—Bulletin B-203 describes magnetic pipeline traps for sanitary and standard applications. These permanent (non-electric) traps are designed to remove tramp iron from liquid flow lines and afford protection to processing equipment. Typical trap installation data given. Eriez Mfg. Co.

385 Wire Rope Handbook—Catalog G-15, 170 pp, is pocket-sized and thumb indexed, and one of the handiest available from standpoints of practical information, easy reference and clarity. Provides up-to-date information on a wide range of Preformed and regular type wire ropes, slings and fittings and includes a section of data helpful in selecting the right rope for the job, installing it properly and keeping it in condition to get best use from it. Macwhyte Company.

386 Hose and Tubing—Catalog CC-400 is a 16-pp illustrated quick-reference booklet on manufacturer's flexible metal hose and tubing. These products are made in two basic types: seamless and strip wound. Catal shows wide range of available alloys and sizes, suggested uses; gives engineering data. The American Brass Co.

387 Production Control Systems, Procedures—Publication X-1268, 56 pp, details a method of material control intended to result in a shorter planning cycle while speeding production by eliminating causes of delay on the production line. Illustrated with typical forms and charts, book outlines procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Remington Rand Inc.

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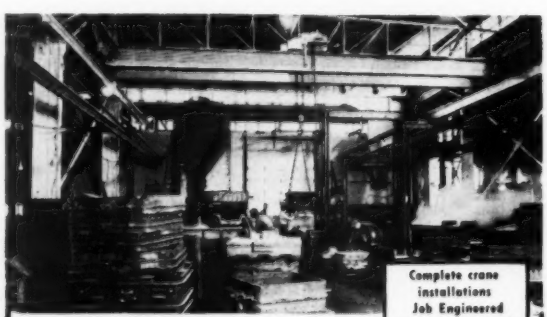

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ABELL-HOWE . . . whose specialized services include designing, manufacturing and in many cases, actually installing cranes . . . weighs these factors and engineers each crane to fit specific conditions. Our high percentage of repeat orders shows the satisfaction of those whom we have served in this way at favorable overall low cost.

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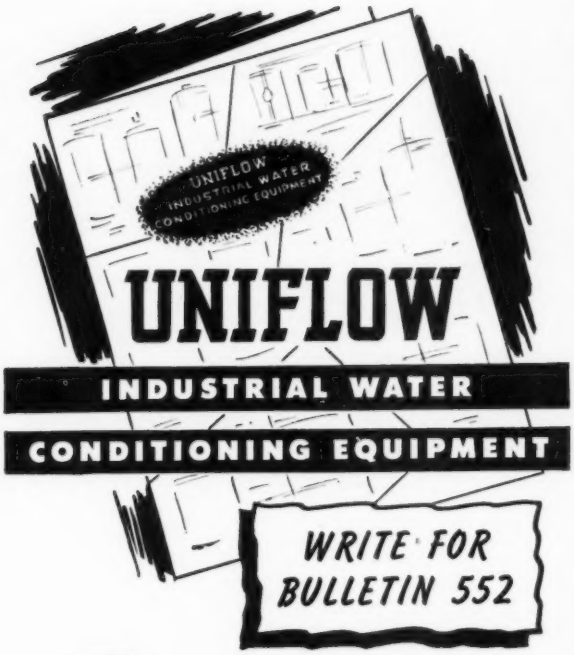

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operate
24 HOURS A DAY
7 DAYS A WEEK
FOR THREE YEARS
IN FLOUR MILL

without lubrication

Arguto self-lubricating bearings never require oiling.

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Even when immersed in flour or other foodstuffs, purity of product is not affected.

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Silent operation for the life of the bearings.

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Installed in inaccessible places, Arguto bearings were "forgotten" for three years.

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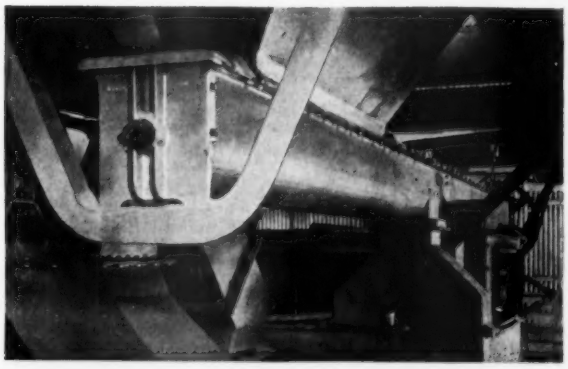

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Protect Health and Profits in Your Plant with

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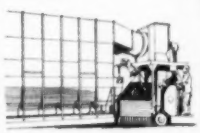
Available in capacities to handle air cleaning jobs—large or small—singly or in batteries.



30,000 CFM arrestor—in a large grey iron foundry removes dirt and dust from shake-out stations, sand handling and conditioning system.

400 CFM to 2500 CFM exhausts dust and fumes from isolated grinding or buffing jacks—self-contained, complete with fan motor and drive.

THE Schmieg AIR PURGE of CENTRI-MERGE

When you have a Schmieg Centri-Merge conditioning unit, designed and engineered for your specific needs, your dust and fume problem is banished once for all. Because Centri-Merge is always dependable, requiring no shutdown during working hours for cleaning or routine maintenance.

Centri-Merge units are used in widely divergent industries, in plants where all kinds of metal working operations are performed, in the chemical industry where purified air is of vital importance.

Centri-Merge operates on a simple principle. It collects pollution in the air, carries it along on a swirling cascade of water to an underwater trap where it is easily disposable as sludge.

Simple installation to occupy a minimum of floor space, maximum savings in low maintenance costs, assurance of years of trouble-free operation, in many cases a reduction in heating expense where re-circulation of air is possible. You can't buy better air cleaning equipment.

Do something about dust and fumes in your plant. Call in Schmieg engineers to develop a unit ideally suited to your needs. Do it today.

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New Centrifugal Blower Line...

Now! Hartzell can meet your utility blower needs

After 27 years of ***industrial*** air-moving experience Hartzell presents their new line of centrifugal blowers. These new blowers, combined with Hartzell propeller-type fans and blowers, round out the line to meet your air-moving requirements

Models to meet practically every industrial need. Belt-drive, direct-drive and special pressure models. Sizes from 4½" to 48". Simple, sturdy, welded-steel construction. Standard and special motors. Speeds to deliver exactly the air needed against almost any pressure.

And they come to you backed by the know-how of your nearby air-minded Hartzell representative.

If you know Hartzell propeller-type fans and vane-axial blowers you know Hartzell centrifugal blowers ***must*** be good. You know they're built for ***industry***. No divided aim, no compromise with other demands.

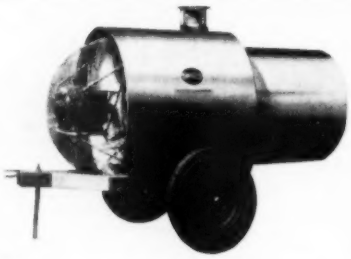
Mail the coupon below, or write for your copy of our new centrifugal blower catalog B-10. It's packed with information.

PROPELLER-TYPE FANS

The famous Hartzell propeller-type fan is made in every conceivable type, from the single-propeller model shown to multiblades, extension-shaft, utility and others.

VANEAXIAL BLOWERS

If you want a powerful blast of high-speed air against pressure, check this blower. Made in belt-drive and direct-drive models, in a wide range of sizes.



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For cold-weather cement laying, heating of large structures under construction and other temporary, shifting needs for large volumes of heat, distributed under high pressure, the Hartzell Hotblast is ideal. Made in 3 sizes—3, 5 and 7½ HP heat-distributing fan—producing hundreds of thousands of BTU. Equipped to burn oil or gas; with electric motor or gasoline engine. Mounted on an all-welded two-wheel trailer. Economical operation, plus powered heat distribution. Write for complete information.

HARTZELL propeller fan co.

Div. of Castle Hills Corp.

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PROPELLER-TYPE FANS • BLOWERS
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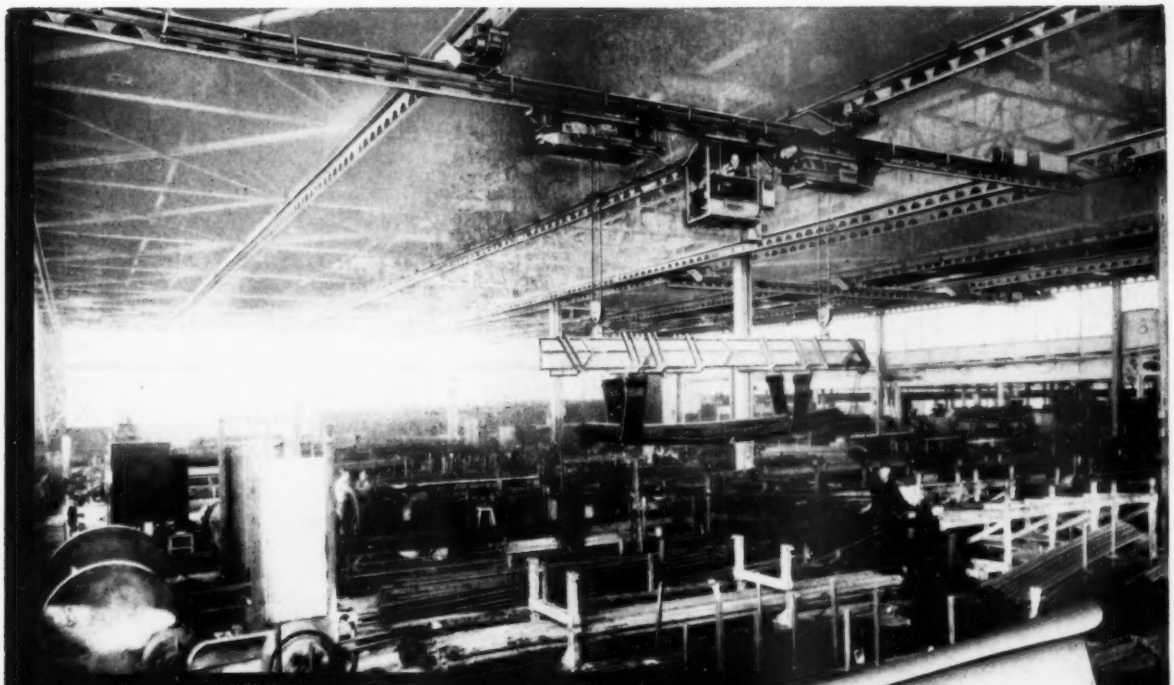
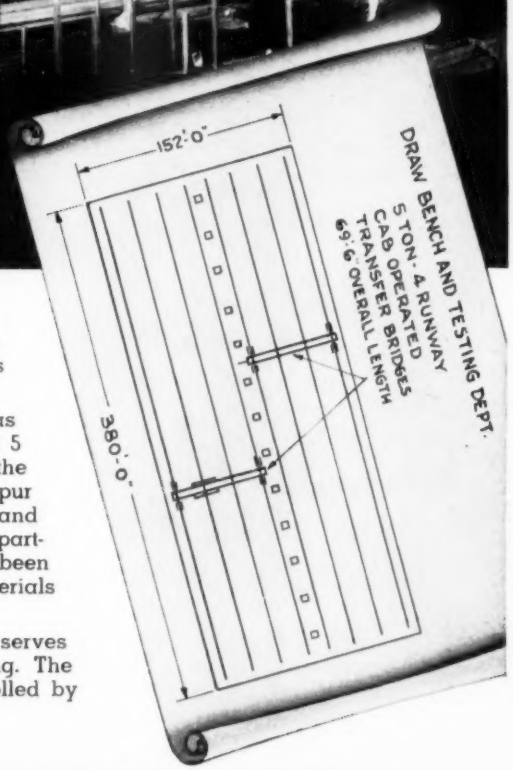


5 TON INTERLOCKING TRANSFER BRIDGES CUT HANDLING TIME



Careful planning in adapting the proper materials handling equipment to serve the large draw bench and testing department of a prominent copper company has paid real dividends because of resulting efficiency.

Instead of employing standard overhead traveling cranes as originally considered, two 4-runway transfer bridges each of 5 ton capacity are used, one on each side of the columns in the middle of the room. The bridges interlock with a short spur enabling a cab-operated carrier to travel from one to the other and provide complete materials handling coverage of the entire department. Thus time-consuming rehandling that would have been required with standard overhead cranes, in transporting materials from one bay to the other is eliminated.

The single cab-operated double-hoist carrier adequately serves the whole department and carries tubing up to 40 feet long. The carrier as well as the transfer bridges are completely controlled by the operator in the cab.

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BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
7534 East 284th Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

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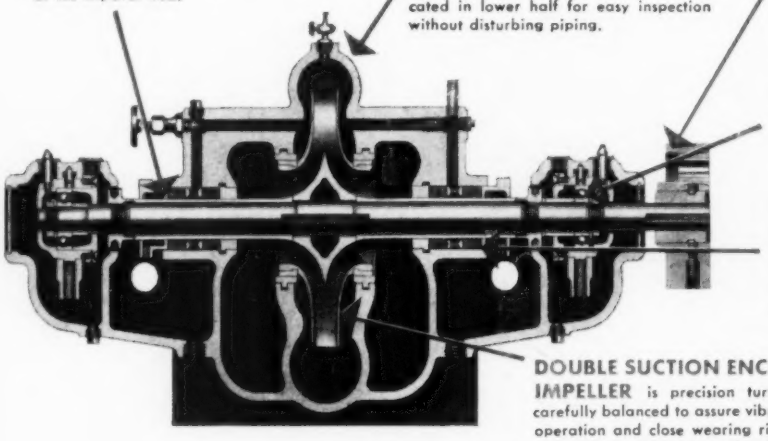
Look for These 7 Signs of GOOD PUMP DESIGN

CAST SHAFT SLEEVES, not commercial tubing, save the shaft from wear. Sleeves extend through the stuffing box and seal at the impeller hub.

HEAVY HORIZONTAL SPLIT CAST-IRON CASING construction with suction and discharge nozzles located in lower half for easy inspection without disturbing piping.

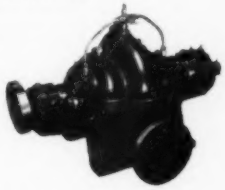
COUPLINGS have *Magic-Grip* quick change bushings for pump and drive shaft. Pin and rubber bushing type usually used. Removal for maintenance is easy.



BALL BEARINGS may be furnished for either oil or grease lubrication. Sleeve bearings also available in larger sizes.

GENEROUS STUFFING BOX LENGTH contains sufficient packing to keep stuffing box maintenance low. Provision is made for sealing water connections or for grease seal if these are required.

DOUBLE SUCTION ENCLOSED IMPELLER is precision turned and carefully balanced to assure vibrationless operation and close wearing ring clearance. Water passages are hand finished to a smooth surface.



STANDARD AND SPECIAL MATERIALS are available for many types of service where government regulations permit. Iron, bronze, stainless steel and combinations of these materials handle both alkaline and acid solutions. Standard sizes carried in stock range from 10 to 7000 gpm with heads as high as 475 feet.

ALLIS-CHALMERS Double Suction PUMPS

THESE DESIGN AND CONSTRUCTION features of Allis-Chalmers double suction pumps assure long pump life and low maintenance costs. Every A-C double suction pump is carefully tested on the most modern pump testing equipment in the industry.

Complete Pumping Unit

Allis-Chalmers can furnish the complete pumping unit — pump, motor, control and drive — all of coordinated design and manufacture.

Whatever your pumping problem, call your nearby Allis-Chalmers Authorized Distributor or District Office. Or write for Bulletin 08B6146. Allis-Chalmers, Milwaukee 1, Wisconsin.

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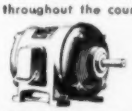

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